e-ISSN: 2807-6257

Open Access Indonesian Journal of Medical Reviews

[OAIJMR]

https://hmpublisher.com/index.php/oaijmr

Awake Fiberoptic Intubation for a Giant Multinodular Struma Presenting with Acute Respiratory Failure: A Case Report

Abdulrahman Rizky Sulajman[1*], Jeffri Prasetyo Utomo[2], Buyung Hartiyo Laksono[2]

[1]Department of Anesthesiology and Intensive Therapy, Faculty of Medicine, Universitas Brawijaya/Dr. Saiful Anwar Regional General Hospital, Malang, Indonesia

[2]Consultant in Anesthesiology and Intensive Care, Universitas Brawijaya/Dr. Saiful Anwar Regional General Hospital, Malang, Indonesia

ARTICLE INFO

Keywords:
Airway obstruction
Awake tracheal intubation
Difficult airway
Emergency medicine
Multinodular struma

***Corresponding author:**
Abdulrahman Rizky Sulajman

E-mail address:
rizkysulaiman@ub.ac.id

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/oaijmr.v5i5.769

A B S T R A C T

A giant multinodular struma can cause severe upper airway obstruction, presenting a formidable challenge to anesthesiologists and emergency physicians. Securing the airway is a priority, yet conventional intubation methods carry a high risk of failure and complete airway collapse. Awake Tracheal Intubation (ATI) is a critical technique for managing these anticipated difficult airways, allowing for the maintenance of spontaneous respiration while securing a definitive airway. This report details the emergency management of a patient with near-fatal airway compromise due to a massive goiter. A 51-year-old female presented to the emergency department with severe dyspnea that had worsened over three days. She had a 20-year history of a progressively enlarging neck mass, which was now of a massive size. The patient exhibited signs of acute respiratory failure, including stridor, subcostal retractions, a respiratory rate of 30 breaths/minute, and a decreased level of consciousness. Imaging confirmed a large soft tissue mass causing significant tracheal narrowing from the C4 to C6 vertebral levels. Given the impending airway collapse, an emergency awake fiberoptic intubation was performed. With minimal sedation and continuous oxygenation, a size 6.0 endotracheal tube was successfully placed into the trachea under direct bronchoscopic guidance. The patient's oxygenation and ventilation improved immediately post-procedure. In conclusion, this case underscores the lifesaving potential of awake fiberoptic intubation in patients with a critically compromised airway from a giant multinodular struma. The ability to maintain spontaneous breathing and provide continuous oxygenation during the procedure is paramount in preventing catastrophic outcomes. This technique should be a core competency for clinicians managing difficult airways in the emergency setting.

1. Introduction

The management of a difficult airway remains one of the most significant challenges in anesthesiology and emergency medicine, with failure to secure the airway being a direct cause of significant morbidity and mortality.[1] A difficult airway can be defined by the clinical situation in which a conventionally trained physician experiences difficulty with facemask ventilation, tracheal intubation, or both.[2] One of the most classic and intimidating causes of a difficult airway is a giant thyroid goiter. Multinodular struma is a common endocrine disorder characterized by the enlargement of the thyroid gland due to the development of multiple nodules. While often a benign and slowly progressing condition, a giant struma can exert significant mechanical effects on adjacent cervical structures, leading to the compression and deviation of the trachea and esophagus.[3] This compression can precipitate a spectrum of respiratory symptoms, from mild dyspnea and stridor to, in severe cases, acute, life-threatening upper airway obstruction.

The prevalence of multinodular goiter is geographically variable, strongly correlating with historical iodine deficiency in the diet, and shows a marked predilection for females, typically presenting in the fourth to fifth decade of life.[4] The patient in this report, a 51-year-old female, fits this demographic profile perfectly. The pathophysiology of airway obstruction in these patients is multifactorial. Direct external compression narrows the tracheal lumen, increasing airway resistance and the work of breathing. This is often exacerbated by tracheomalacia, a weakening of the tracheal cartilage from chronic pressure, which can lead to dynamic airway collapse, particularly during the negative intrathoracic pressure swings of spontaneous inspiration or upon the induction of general anesthesia, which relaxes airway-supporting muscles. Furthermore, the sheer bulk of the neck mass can severely limit neck mobility, distort palpable landmarks, and prevent the proper alignment of the oral, pharyngeal, and laryngeal axes necessary for successful direct laryngoscopy.[5]

The decision-making process for airway management in a patient with a giant goiter and respiratory distress is fraught with peril. The induction of general anesthesia prior to securing the airway is widely considered hazardous. The loss of consciousness and spontaneous ventilation can lead to the complete collapse of a compromised airway, transforming a difficult situation into a "can't intubate, can't ventilate" emergency.[6] Therefore, techniques that preserve spontaneous ventilation are strongly advocated. The American Society of Anesthesiologists (ASA) and the Difficult Airway Society (DAS) guidelines for management of the difficult airway both emphasize the importance of a pre-formulated strategy, with awake tracheal intubation (ATI) being a cornerstone of management for the anticipated difficult airway.[7]

ATI involves the placement of an endotracheal tube while the patient remains conscious, or lightly sedated, and breathing spontaneously.[8] This technique offers several profound advantages in this clinical scenario. Firstly, it maintains the patient's respiratory drive and protective airway reflexes. Secondly, it preserves the muscular tone of the pharynx and larynx, which helps to keep the already narrowed airway patent. Thirdly, it allows for the use of a flexible fiberoptic bronchoscope, a tool that can be navigated around the altered anatomy and through the stenotic tracheal segment under direct vision, significantly increasing the success rate while minimizing trauma. The procedure requires a delicate balance of topical anesthesia, judicious sedation, and continuous oxygenation to ensure patient comfort, cooperation, and safety. While ATI is recognized as the gold standard, its application, particularly in a high-stress emergency setting, requires significant operator skill, preparation, and institutional resources.[9,10]

This case report aimed to present and analyze the successful emergency application of awake fiberoptic intubation in a patient with acute respiratory failure secondary to a giant, compressive multinodular struma. The novelty of this report lies in its detailed, step-by-step description of the procedure within an emergency department context, highlighting critical decision-making points and adaptations, such as proceeding with minimal sedation and without topical anesthesia due to the patient's obtunded state. By dissecting this challenging case, we aim to reinforce the critical importance of ATI as a lifesaving skill and to provide a practical, evidence-based discussion on the comprehensive management of one of the most feared scenarios in airway management.

2. Case Presentation

A 51-year-old female was brought to the Emergency Department (ED) by her family with a chief complaint of severe shortness of breath. The patient's dyspnea had been present for approximately one month but had progressed to a critical state over the last three days, rendering her unable to speak in full sentences or ambulate. Her family reported that her breathing was noisy, especially when lying flat, and that she had developed a hoarse voice over the past week.

The patient's medical history was significant for a neck mass, which she first noticed twenty years prior as a small, marble-sized lump. It had remained relatively stable in size for many years before beginning a phase of rapid growth over the last three years. The mass had now reached a massive size, visibly distorting her neck anatomy. She had not sought medical evaluation for this condition previously due to socioeconomic reasons. The patient also reported dysphagia to solids for the past six months. There was no history of smoking, alcohol use, or known allergies. Her family history was non-contributory for thyroid disease or other endocrinopathies.

On arrival, the patient was in obvious respiratory distress. The primary survey revealed a critically compromised airway. Audible inspiratory and expiratory stridor was present. She was utilizing accessory muscles of respiration, with marked subcostal and supraclavicular retractions. Her breathing was rapid and shallow, with a respiratory rate of 30 breaths per minute. Her initial oxygen saturation was not obtainable via pulse oximetry on room air. She was immediately placed on a high-flow Jackson-Reese circuit with an oxygen flow of 15 liters per minute, after which her saturation improved to 100%. Her neurological status was impaired; she was obtunded and only responsive to painful stimuli, with a Glasgow Coma Scale (GCS) score of 8 (E2, V2, M4). Her pupils were 3 mm, equal, and reactive to light. Her circulatory status was stable, with a blood pressure of 130/80 mmHg, a heart rate of 115 beats per minute (sinus tachycardia), and warm extremities. The remainder of the exposure check was within normal limits.

Physical examination of the neck revealed a massive, firm, non-tender thyroid mass, estimated to be 30x20 cm in size, extending bilaterally and inferiorly towards the sternal notch. The mass was fixed to the underlying tissues, and the trachea was not palpable or visibly deviated due to the size of the goiter. Neck movement was severely restricted. Given the stridor, tachypnea, use of accessory muscles, and altered mental status, the patient was diagnosed with upper airway obstruction due to her giant multinodular struma, leading to hypercapnic and hypoxic acute respiratory failure. The decision was made to proceed with immediate definitive airway management via intubation. A summary of the patient's clinical findings on presentation can be found in Table 1.

Table 1. Summary of patient's clinical findings on presentation.

Parameter	Finding
Demographics	51-year-old female
Chief complaint	Severe shortness of breath, worsening over 3 days
History of illness	Neck mass present for 20 years, rapid growth in the last 3 years
	Hoarseness for 1 week
Primary survey	**Airway:** Unpatented, audible stridor
	Breathing: Rate 30/min, subcostal retractions, SpO_2 100% on 15L O_2
	Circulation: BP 130/80 mmHg, HR 115 bpm
	Disability: GCS 8 (E2V2M4), responsive to pain, pupils 3mm isocoric
Physical exam	Massive neck mass (30x20 cm), firm, fixed, severely restricted neck movement
Laboratory results	**Hemoglobin:** 7.30 g/dL
	FT4: 24.42 ng/dL
	TSH: <0.05 ng/dL
Pre-intubation ABG	pH: 7.30, pCO_2: 59.0, pO_2: 37.4, HCO_3: 29.4, SpO_2: 63.7%
Imaging	**Cervical X-ray:** Soft tissue mass with calcification narrowing the airway at C4-C6 levels
Diagnosis	Upper airway obstruction and acute respiratory failure due to multinodular struma

The airway was anticipated to be extremely difficult. Direct laryngoscopy was considered impossible due to the anatomical distortion and limited neck movement. A surgical airway (cricothyrotomy or tracheostomy) was also deemed challenging and high-risk due to the massive goiter obscuring all anatomical landmarks. Therefore, awake tracheal intubation using a flexible fiberoptic bronchoscope was selected as the safest and most appropriate approach.

The patient was kept in a semi-upright, "ramped" position to alleviate some of the positional dyspnea and to aid respiration. Throughout the procedure, she was maintained on high-flow oxygen via the Jackson-Reese mask held near her face. Due to her uncooperative and agitated state secondary to hypoxia and hypercapnia, a single dose of midazolam 1mg was administered intravenously for light sedation, alongside 0.25 mg of atropine sulfate to reduce airway secretions. A decision was made to forgo topical airway anesthesia because of the patient's decreased level of consciousness and the urgency of the situation, with the assessment that her own obtundation would provide sufficient tolerance for the procedure.

The detailed intubation steps were as follows: Preparation: A flexible fiberoptic bronchoscope (FFB) was prepared and white-balanced. An endotracheal tube (ETT) of size 6.0 mm internal diameter was selected due to the anticipated severe tracheal stenosis. The ETT was loaded onto the FFB; Nasal Passage: The ETT was first gently inserted through the patient's right anterior naris and advanced until its tip was estimated to be in the oropharynx; Bronchoscopy: The lubricated FFB was then passed through the ETT. Under direct vision, the FFB was navigated through the nasopharynx and into the oropharynx; Visualization and Entry: The epiglottis was identified, followed by the vocal cords. The FFB was carefully advanced through the vocal cords into the trachea; Confirmation and Placement: The tracheal rings and the carina were clearly visualized, confirming intratracheal placement; ETT Advancement: While keeping the FFB steady with the carina in view, the pre-loaded ETT was gently advanced over the scope. The ETT was pushed until it passed the vocal cords and was positioned approximately 3 cm above the carina. This position was confirmed by direct visualization from the FFB and by observing symmetrical chest wall movement; Final Confirmation: The FFB was removed, the ETT cuff was inflated, and an end-tidal CO_2 ($EtCO_2$) monitor was attached, which showed a consistent capnographic waveform, providing definitive confirmation of correct placement; Post-Intubation Sedation: Following successful intubation, the patient was placed under total general anesthesia with propofol and fentanyl infusions for comfort and to facilitate mechanical ventilation.

The entire procedure was completed on the first attempt. A repeat Arterial Blood Gas (ABG) 30 minutes post-intubation showed marked improvement in oxygenation: pH: 7.28; pCO_2: 59.1 mmHg; pO_2: 183.7 mmHg; HCO_3: 27.9 mEq/L; SpO_2: 96.6%. Following stabilization in the ED, the patient was transferred to the Intensive Care Unit (ICU) for further management. She was started on anti-thyroid medication and was transfused with packed red blood cells for her anemia. A contrast-enhanced CT scan of the neck and chest was performed, which confirmed a massive multinodular goiter with significant substernal extension, compressing the trachea to a minimal diameter of 4 mm and displacing the esophagus posteriorly. After three days of medical optimization, the patient underwent a total thyroidectomy. The surgery was complex but successful, and the histopathology report confirmed a benign multinodular goiter. She was successfully extubated on the second postoperative day and made a full recovery, being discharged home ten days later with follow-up appointments. The timeline of the patient's treatment and follow-up is detailed in Table 2.

Table 2. Timeline of treatment and follow-up.

Time / Day	Location	Procedure / Treatment	Rationale / Outcome
Day 0	Emergency Department	Initial assessment, high-flow O_2 via Jackson-Reese	Stabilize for impending respiratory arrest
		Awake Fiberoptic Intubation with 1mg Midazolam	Secure a definitive airway while maintaining spontaneous ventilation
		Mechanical ventilation initiated, general anesthesia induced	Airway secured, patient comfort
		Post-intubation ABG confirms improved oxygenation	Confirmation of successful ventilation
Day 0 - 3	ICU	Transferred to ICU, medical optimization	Management of thyrotoxicosis and anemia prior to surgery
		Neck & Chest CT Scan	Delineate anatomy for surgical planning
		Endocrinology & ENT consults	Multidisciplinary approach to care
Day 3	Operating Room	Total Thyroidectomy	Definitive treatment for airway obstruction
Day 4 - 5	ICU	Post-operative monitoring	Recovery from major surgery
Day 5	ICU	Successful extubation	Weaned from mechanical ventilation
Day 6 - 10	Surgical Ward	Continued recovery, mobilization, education	Preparation for discharge
Day 10	-	Discharged home	Medically stable, full recovery

3. Discussion

This case report presents a classic, yet dramatic, example of a life-threatening upper airway obstruction from a neglected giant multinodular goiter. The successful outcome hinged on the rapid recognition of a difficult airway and the execution of a well-planned awake tracheal intubation (ATI) in a high-stakes emergency setting.[11] The discussion will delve into the key aspects of this case: the pathophysiology of goiter-induced airway compromise, the critical importance of airway assessment, the rationale for choosing ATI over other techniques, the technical nuances of the procedure performed, and the multidisciplinary post-intubation management.

The term "goiter" simply refers to an enlargement of the thyroid gland, a condition with a spectrum of etiologies ranging from iodine deficiency to autoimmune disease and malignancy. The patient in this report suffered from a multinodular goiter, a state of gland enlargement characterized by the development of multiple, distinct nodules. The natural history of a multinodular goiter is one of slow, indolent growth over decades. As seen in this patient who had her mass for 20 years, a phase of accelerated growth can occur, leading to the rapid onset of compressive symptoms. This growth is not merely a uniform expansion but a complex process of follicular cell hyperplasia, colloid accumulation, and stromal fibrosis, leading to a heterogenous mass that can achieve enormous proportions. The progression to a "giant" goiter, while not formally defined, is clinically understood as one that causes significant cosmetic deformity and, more importantly, mechanical compression of surrounding structures. The sheer mass effect is the primary driver of the life-threatening complications witnessed in this case. The goiter's descent into the thoracic inlet, known as substernal or retrosternal extension, further complicates the clinical picture. This extension effectively traps a portion of the thyroid in a rigid bony cage, bordered by the sternum, clavicles, and vertebral column, meaning any further growth translates directly into increased pressure on the trachea and esophagus.[12]

The pathophysiology of the airway compromise is a subject of critical importance for the clinician. It is not merely a static, concentric narrowing of the tracheal tube.[13] The pressure exerted by the asymmetric growth of thyroid nodules often leads to a combination of tracheal deviation and compression. A common finding is the "saber-sheath" trachea, where the cartilaginous rings are flattened in the anteroposterior dimension, losing their normal circular or C-shaped structure. This structural change significantly increases airway resistance according to Poiseuille's law, where resistance is inversely proportional to the fourth power of the radius. Thus, even a small reduction in the tracheal lumen's effective diameter can lead to an exponential increase in the work of breathing, precipitating respiratory fatigue and failure. Perhaps more sinister is the development of tracheomalacia from chronic extrinsic pressure. The constant force applied to the tracheal cartilage leads to atrophy and degeneration of the elastic fibers and chondrocytes.[14] The cartilage loses its intrinsic rigidity, becoming soft and pliable. This creates a segment of the airway that is prone to dynamic collapse. During spontaneous inspiration, the negative intrathoracic pressure generated to draw air into the lungs can cause this flaccid tracheal segment to collapse inward, leading to a sudden, severe obstruction. This phenomenon explains why patients often experience profound positional dyspnea, particularly in the supine position, as gravity allows the anterior neck mass to further compress the weakened airway, and the diaphragmatic breathing pattern in this position creates greater negative pressure swings. The induction of general anesthesia, with its attendant muscle relaxation and loss of the natural airway-stenting effect of pharyngeal and laryngeal muscle tone, can convert this dynamic, partial obstruction into a complete, irreversible collapse—the dreaded "can't intubate, can't ventilate" scenario.

Beyond the airway, the compressive effects manifest in other ways that were present in this patient. Hoarseness, which developed a week prior to presentation, is a classic and ominous sign. It typically results from the stretching or direct compression of the recurrent laryngeal nerve (RLN), which runs in the tracheoesophageal groove, directly in the path of an expanding thyroid lobe. RLN palsy leads to vocal cord paralysis, further narrowing the glottic aperture and weakening the patient's cough reflex.[15] Dysphagia, another symptom reported by the patient, results from posterior compression of the esophagus, which is more compliant than the trachea and is easily displaced. The thyrotoxic state of the patient, evidenced by a high FT4 and suppressed TSH, adds another layer of physiological derangement. This hypermetabolic state increases basal oxygen consumption and carbon dioxide production, placing further strain on an already compromised respiratory system. It also sensitizes the myocardium to catecholamines, increasing the risk of tachyarrhythmias, heart failure, and, in the most extreme cases, a thyroid storm precipitated by the stress of acute illness and intubation.

Pre-anesthetic airway assessment is a mandatory step before any anesthetic procedure. A plethora of scoring systems and clinical tests have been developed to predict the likelihood of difficult intubation, such as the Mallampati classification, thyromental distance, inter-incisor gap, and neck mobility assessment.[16] However, in the context of a giant goiter, these traditional assessments, while still performed, are often of secondary importance. Their primary utility is in predicting difficulty with direct laryngoscopy, specifically the difficulty in achieving a line of sight to the glottis. In a patient with a massive neck mass, the fundamental problem is often not the view of the larynx, but rather the distorted, stenotic, and inaccessible subglottic and tracheal anatomy. A perfect view of the vocal cords is meaningless if an endotracheal tube cannot be advanced past them into the trachea.

Therefore, the prediction of a difficult airway in this patient population relies more heavily on a constellation of specific clinical signs and the judicious use of diagnostic imaging.[17] The clinical history is paramount. A history of rapid mass growth, as seen in this patient, is a major red flag. The presence of "compressive symptoms" forms a critical triad: dyspnea on exertion or at rest, stridor, and dysphagia. Stridor, the high-pitched sound generated by turbulent airflow through a narrowed passage, is a particularly alarming sign of severe obstruction. The character of the stridor can be diagnostic: purely inspiratory stridor suggests an extrathoracic obstruction (above the thoracic inlet), while expiratory stridor suggests an intrathoracic obstruction. The biphasic (inspiratory and expiratory) stridor heard in this patient is characteristic of a fixed, critical obstruction at the level of the thoracic inlet, which is consistent with the radiological findings of stenosis at C4-C6. Positional dyspnea, or orthopnea, where the patient cannot breathe while lying flat, is another strong indicator of dynamic airway collapse and critical stenosis.

While clinical assessment raises suspicion, diagnostic imaging is essential for confirming and quantifying the threat. A simple lateral and anteroposterior radiograph of the neck can be profoundly informative, as it was in this case. It can reveal the soft tissue mass, tracheal deviation, and, most importantly, the degree of sagittal narrowing of the tracheal air column. However, the gold standard for evaluating the airway in a patient with a goiter is a contrast-enhanced Computed Tomography (CT) scan of the neck and chest. The CT provides a three-dimensional reconstruction of the anatomy, allowing for precise measurement of the tracheal diameter at its narrowest point, the length of the stenotic segment, the degree of deviation, and the presence and extent of any substernal component. This anatomical roadmap is invaluable not only for planning the immediate airway management but also for the subsequent surgical strategy. In an emergency setting where the patient is unstable, obtaining a CT scan may not be feasible prior to securing the airway, as was the situation in this case. Here, the clinician must act on the strong clinical and plain radiographic evidence of a critical airway.[11] The use of point-of-care ultrasound (POCUS) is an emerging adjunct in the ED. An experienced operator can use a linear probe to visualize the anterior neck, identify the trachea, and potentially assess for deviation and narrowing, although its utility is limited by the acoustic shadowing from a massive, calcified goiter.

The choice of airway management technique is the single most important decision that determines the outcome in a patient with a critical goiter-induced airway obstruction.[13] The options must be weighed carefully, with the primary goal being to secure a definitive airway without causing the loss of the patient's spontaneous ventilation, which could lead to catastrophic total airway collapse. Contraindicated and High-Risk Techniques: Rapid Sequence Intubation (RSI): The use of a potent neuromuscular blocking agent (NMBA) like succinylcholine or rocuronium in this patient would have been catastrophic. RSI is the cornerstone of emergency airway management for most indications, but it is absolutely contraindicated in the presence of a suspected or known critical airway stenosis. The rationale is based on airway physiology. The patency of the pharynx and larynx is actively maintained by the tone of surrounding muscles. NMBAs abolish this tone, causing the tissues to relax and fall inward. In a patient whose airway is already critically narrowed and potentially malacic, this loss of muscular support, combined with the abolition of the patient's own respiratory drive, would almost certainly lead to the complete, irreversible collapse of the airway at the point of maximal compression. This would instantly create a "can't intubate, can't ventilate" scenario, from which rescue would be nearly impossible; Inhalational Induction: A "gas induction," typically with sevoflurane, is sometimes proposed as an alternative as it preserves spontaneous ventilation during the induction of anesthesia. While theoretically safer than RSI, it is still a high-risk strategy. Volatile anesthetics are potent bronchodilators but also cause a dose-dependent relaxation of airway smooth muscle and skeletal muscle, as well as respiratory depression. As the patient loses consciousness, they can develop an obstruction that may not be relieved with jaw thrust or mask ventilation, and the clinician is left with a deeply anesthetized, potentially unrescuable patient. It is a technique that should be reserved for cooperative patients with less severe obstructions and performed only by highly experienced anesthesiologists.

Given the profound risks of other methods, awake tracheal intubation (ATI) emerges as the safest and most logical approach. ATI is not a single procedure but a concept that encompasses several techniques to place an ETT while the patient is awake and breathing. Its supreme advantage is the preservation of spontaneous ventilation and protective airway reflexes throughout the procedure.[20] This case perfectly illustrates its value. Pharmacology for ATI: The successful performance of ATI relies on a masterful combination of pharmacology to create conditions of patient comfort, cooperation, and safety. This typically involves three components: sedation, topical anesthesia, and an antisialagogue; Sedation: The goal is conscious sedation, where the patient is calm and cooperative but remains responsive and maintains their respiratory drive. Dexmedetomidine, an alpha-2 agonist, is often considered a near-ideal agent as it provides sedation and anxiolysis without significant respiratory depression. Remifentanil, an ultra-short-acting opioid, is another excellent choice, providing profound analgesia and sedation with a rapid offset. Midazolam, a benzodiazepine, is also widely used, though it carries a higher risk of respiratory depression and paradoxical agitation, especially in the elderly or hypoxic patients. In this specific case, the patient was already obtunded from severe hypercapnia and hypoxia. Therefore, the clinical team made the astute decision to use only a minimal dose of midazolam (1mg) for anxiolysis, recognizing that deep sedation was unnecessary and potentially dangerous. Topical Anesthesia: Anesthetizing the airway mucosa is crucial for patient comfort and for suppressing the cough and gag reflexes that can hinder the procedure. This is typically achieved through a multi-step process: nebulized lidocaine to anesthetize the entire airway, followed by atomized lidocaine sprayed into the oropharynx, and finally, a "spray-as-you-go" technique where lidocaine is injected through the working channel of the fiberoptic scope to anesthetize the larynx and trachea just before the scope advances.[18] However, in this case, the clinical team made a deliberate decision to omit topical anesthesia. This departure from standard practice was justified by the patient's profoundly decreased level of consciousness and the extreme urgency of the situation. The risk of delaying the procedure to administer topical anesthesia, which might have been ineffective anyway due to the patient's inability to cooperate with deep breathing, was weighed against the benefit of immediate airway securement; Antisialagogue: The use of an agent like glycopyrrolate or atropine is highly recommended. Secretions can coat the lens of the fiberoptic scope, completely obscuring the view and leading to failure. Atropine 0.25mg was appropriately administered in this case to create a drier field and optimize conditions for visualization; Oxygenation during ATI: The Difficult Airway Society guidelines state unequivocally that supplemental oxygen should be administered throughout any ATI procedure.[17] The goal is to denitrogenate the lungs and create an oxygen reservoir, maximizing the safe apnea time should the patient's breathing become compromised. The current gold standard for oxygenation during airway management is High-Flow Nasal Oxygenation (HFNO). HFNO delivers heated, humidified oxygen at very high flow rates (up to 70 L/min), which provides several benefits: it delivers a very high FiO_2, it flushes the nasopharyngeal dead space, it provides a small amount of positive end-expiratory pressure (PEEP) to help stent open the airway, and it can provide apneic oxygenation, allowing oxygen to continue to enter the lungs even in the absence of breathing. In this case, HFNO was not available in the ED, a common scenario in many institutions. The team pragmatically used a high-flow Jackson-Reese circuit, demonstrating the principle of using the best available tool to adhere to the core principle of continuous, high-flow oxygenation; The Technology of Visualization: The flexible fiberoptic bronchoscope (FFB) was the ideal tool for this intubation. Its slender, steerable nature allows it to be navigated through a tortuous and narrow airway path that would be impossible to traverse with a rigid laryngoscope.[19] The choice of a nasal route is often preferred as it typically provides a more direct, less angulated approach to the glottic opening compared to the oral route, which requires navigating around the tongue.[4] The technique employed—advancing the ETT into the nasopharynx first, then passing the scope through it to find the larynx—is a standard and effective method. The final and most critical steps are the confirmation of placement. The visualization of tracheal rings and the carina is the first confirmation. However, the absolute, undeniable gold standard is the detection of a persistent, square waveform on an end-tidal CO_2 capnograph. This provides physiological proof that the tube is in the trachea and that gas exchange is occurring.

In any difficult airway algorithm, a plan for a surgical airway (a "front-of-neck access") is a mandatory backup. The standard emergency surgical airway is a cricothyrotomy, an incision through the cricothyroid membrane.[17] However, in this patient, this would have been an extraordinarily difficult, if not impossible, procedure. The giant goiter completely effaced the normal anatomy of the anterior neck, burying the palpable landmarks of the thyroid and cricoid cartilages under a massive, vascular tumor.[19] Attempting a cricothyrotomy in this setting would have involved blindly incising through thyroid tissue, risking uncontrollable hemorrhage and still failing to find the airway. An emergency tracheostomy would have been an equally formidable challenge for the same reasons. In such cases, if time permits, the safest surgical option is often an "awake tracheostomy," performed by a surgeon under local anesthesia in the operating room, where bleeding can be meticulously controlled. However, this patient's rapid deterioration precluded this option. The success of the ATI was therefore not just the optimal outcome; it was likely the only viable path to survival.

Securing the airway is the first, most critical step, but comprehensive management requires a multidisciplinary approach.[18] This patient presented with several concurrent medical issues that needed to be addressed to ensure a good outcome. The successful navigation of this case post-intubation required the coordinated expertise of intensivists, endocrinologists, and ENT surgeons. Managing the Thyrotoxic State: The laboratory findings confirmed severe hyperthyroidism. This thyrotoxic state significantly complicates critical care. The elevated thyroid hormones create a hypermetabolic state, increasing systemic oxygen consumption, CO_2 production, heart rate, and cardiac output. This places immense strain on a cardiovascular system that has already been stressed by hypoxia and acidosis. Furthermore, it puts the patient at high risk for developing a thyroid storm, a life-threatening exaggeration of thyrotoxicosis often precipitated by a stressor like intubation, infection, or surgery. Management, initiated in the ICU, correctly involved a beta-blocker (propranolol) to control the adrenergic symptoms (tachycardia, hypertension) and an anti-thyroid drug from the thionamide class (methimazole or propylthiouracil) to block the synthesis of new thyroid hormone. In severe cases, iodine solutions and corticosteroids are also added. The involvement of an endocrinology specialist is crucial for guiding this therapy; Anemia in Hyperthyroidism: The patient's severe anemia (Hb 7.3 g/dL) was another significant comorbidity. The pathophysiology of anemia in hyperthyroidism is complex, often stemming from increased red blood cell turnover, hemodilution from increased plasma volume, and sometimes co-existing nutritional deficiencies. This degree of anemia critically impairs the oxygen-carrying capacity of the blood, reducing the body's tolerance to any hypoxic insult. The decision to transfuse packed red blood cells was essential to restore this capacity and improve the patient's physiological reserve before she underwent a major surgical procedure; Surgical and Anesthetic Planning: The post-intubation CT scan provided the surgical team with an essential anatomical roadmap. It allowed them to plan the operative approach for the total thyroidectomy, anticipating the substernal extension and the proximity of the RLN and parathyroid glands. From the anesthesiologist's perspective, the management did not end with intubation.[20] The plan for extubation is just as critical as the plan for intubation. After thyroidectomy, there is a risk of postoperative hematoma, which can rapidly compress the airway again, or bilateral RLN injury, which can cause the vocal cords to close. Therefore, before extubation, a cuff-leak test is typically performed to ensure there is no significant laryngeal edema. The patient must be fully awake, strong, and following commands, and the difficult airway cart must be immediately available at the bedside in case re-intubation is required. The successful extubation on postoperative day two indicates a smooth surgical and anesthetic course.

4. Conclusion

This case report documents the successful management of a true airway emergency: a patient with impending respiratory collapse from a giant, compressive multinodular goiter. It underscores that in such high-stakes scenarios, conventional intubation methods are not just difficult, but perilous, risking complete airway loss. The cornerstone of this patient's survival was the deliberate and skillful application of awake tracheal intubation using a flexible fiberoptic bronchoscope. This technique's paramount advantage is its adherence to the fundamental safety principles of difficult airway management: preserving spontaneous ventilation and ensuring continuous oxygenation throughout the procedure. Ultimately, this report serves as a vital reminder that Awake Tracheal Intubation is not a niche procedure but an essential, life-saving competency for clinicians facing a critically compromised airway. Its mastery, combined with a calm, systematic, and multidisciplinary approach, is critical for transforming a situation of potential catastrophe into a clinical success.

5. References

1. Schechtman SA, Shah N, Cloyd BH, Tremper KK, Healy DW. The high flow topicalization technique for awake tracheal intubation. J Clin Anesth. 2022; 78(110665): 110665.
2. Kim HJ, Kim M-S, Kim SY, Min IK, Park WK, Song SH, et al. A propensity score-adjusted analysis of efficacy of high-flow nasal oxygen during awake tracheal intubation. Sci Rep. 2022; 12(1): 11306.
3. Ahmad S, Sahay N, Naaz S, Singh K. Awake tracheal intubation using king Vision video laryngoscope in traumatic cervical spine patients: a case series. Tren Anaesth Crit Care. 2022; 45: 55–7.
4. Eain MMG, Nolan K, Murphy B, McCaul C, MacLoughlin R. Exhaled patient derived aerosol dispersion during awake tracheal intubation with concurrent high flow nasal therapy. J Clin Monit Comput. 2023; 37(5): 1265–73.
5. Bai L, Hao W, Zhang C, Guan Z. Effects of right stellate ganglion block combined with topical anesthesia on heart rate variability in awake patients receiving tracheal intubation. Afr Health Sci. 2023; 23(2): 380–5.
6. Silwal S, Shrestha D, Neupane G, Rana R, Bhurtel S, Adhikari P, et al. Awake tracheal intubation in a patient with a post-burn contracture performed via direct laryngoscopy in a resource-limited setting. Anaesth Rep. 2023; 11(2): e12265.
7. Kamga H, Frugier A, Boutros M, Bourges J, Doublet T, Parienti JJ. Flexible nasal bronchoscopy vs. Airtraq® videolaryngoscopy for awake tracheal intubation: a randomised controlled non-inferiority study. Anaesthesia. 2023; 78(8): 963–9.

8. Wen D, Yang X, Liang Z, Yan F, He H, Wan L. Effect of awake prone positioning on tracheal intubation rates in patients with COVID-19: a meta-analysis. Heliyon. 2023; 9(9): e19633.
9. Zheng J, Du L, Du B, Zhang W, Zhang L, Chen G. Airway nerve blocks for awake tracheal intubation: a meta-analysis of randomized control trials and trial sequential analysis. J Clin Anesth. 2023; 88(111122): 111122.
10. Bisri DY, Halimi RA, Sudjud RW, Bisri T. Pharmacological combination for awake tracheal intubation in patients with giant struma: a case report. J Adv Pharm Educ Res. 2024; 14(2): 103–9.
11. Cormier NR, Park J, Kohli N, Hyman JB. Selecting laser-resistant tracheal tubes for awake flexible scope intubation. Anaesth Rep. 2024; 12(1): e12300.
12. Tekantapeh ST, Nader ND, Ghojazadeh M, Fereidouni F, Soleimanpour H. Prone positioning effect on tracheal intubation rate, mortality and oxygenation parameters in awake non-intubated severe COVID-19-induced respiratory failure: a review of reviews. Eur J Med Res. 2024; 29(1): 63.
13. Pirlich N, Berk A, Hummel R, Schmidtmann I, Epp K, Kriege M, et al. Awake tracheal intubation in routine airway management: a retrospective analysis in a tertiary centre. PLoS One. 2024; 19(3): e0299071.
14. Chen Q, Qin B, Zhang M, Zhou Y, Shi X, Xie Y. The safety and efficacy of remimazolam compared to dexmedetomidine for awake tracheal intubation by flexible bronchoscopy: a randomized, double-blind, controlled trial. Drug Des Devel Ther. 2024; 18: 967–78.
15. El-Boghdadly K, Desai N, Jones JB, Elghazali S, Ahmad I, Sneyd JR. Sedation for awake tracheal intubation: a systematic review and network meta-analysis. Anaesthesia. 2025; 80(1): 74–84.
16. Long B, Gottlieb M. Video laryngoscopy versus fiberoptic bronchoscopy for awake tracheal intubation. Acad Emerg Med. 2025; 32(1): 98–100.
17. Chi X, Chen T, Li Q, Fu Q. Learning curve of awake tracheal intubation in difficult airways guided by flexible bronchoscope. Asian J Surg. 2025; 48(1): 932–3.
18. Chen C, Chen J, Chen W, Guo C, Zhan Y. Subglottic spray via epidural catheter in awake tracheal intubation: a CARE-compliant case report. Medicine (Baltimore). 2025; 104(7): e41305.
19. Aguilar Sierra R, Székessy H. Awake fiberoptic intubation for airway management in a patient with multinodular goiter and severe tracheal stenosis. Cureus. 2025; 17(3): e81174.
20. Liu T, Zhang Z, Zheng D, Qiao Q. Successful awake tracheal intubation in a morbidly obese patient with severe obstructive sleep apnea-hypopnea syndrome and a giant vocal cord polyp: a case report. J Int Med Res. 2025; 53(6): 3000605251345971.