CASE REPORT

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A Case Series of Patients With Complex Airway Disease and Large Thyroid Tumors Anterior to the Trachea Precluding Tracheostomy

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BACKGROUND: This case series explores the management of respiratory failure in patients with large anterior tracheal thyroid tumors where tracheostomy is not an option. To our knowledge, this study is the first to address the challenges associated with caring for such patients.

CASE SUMMARY: We present the clinical courses of four intubated adults with advanced thyroid cancer and complex airway issues that preclude surgical tracheostomy. Interventions included custom airway stents, long-term intubation, and oncological therapies. Ethical quandaries around patient autonomy and capacity emerged, exacerbated by the absence of viable exit strategies for prolonged intubation, notably the performance of a tracheostomy, causing emotional distress in patients, families, and staff.

CONCLUSIONS: This study showcases the multifaceted challenges in medical, ethical, and emotional domains associated with managing intubated patients with complex disease precluding tracheotomies. We advocate for a nuanced, multidisciplinary, and personalized approach to confront unique issues in airway management, ethical considerations, and disposition.

KEYWORDS: critical care; intensive care; respiratory failure; thyroid cancer; tracheostomy

Intensivists are faced with unique clinical challenges when managing nonresolving respiratory failure in intubated patients with advanced thyroid cancers located anterior to the trachea if the underlying neck pathology precludes the placement of a tracheostomy (1). In this select group of patients, mechanical ventilation, weaning, and delivery of usual respiratory care, becomes problematic. In the absence of the traditional tracheostomy option, clinicians must navigate complex airway, clinical, and ethical dilemmas. To our knowledge, this troubling scenario and associated management strategies have not been described.

Between 2021 and 2023, 116 patients were admitted to our ICU from the Head and Neck Oncology (HNO) Service, representing 3.5% of 3291 total ICU admissions. In this case series, we illustrate the clinical courses of four (3.4%) of these HNO patients, each with thyroid cancers anterior to their tracheas precluding tracheostomies. We track these patients through their ICU and hospital stays, sourcing patient information from the hospital's electronic health record and an ICU database. Institutional review board waiver approval was obtained (Privacy Board-A. Title: Critical Airway Management in Patients with Large Neck Tumors. Protocol number 23-104).

CASE SERIES

Patient 1

A 49-year-old woman with advanced follicular thyroid carcinoma and a large unresectable anterior tracheal thyroid mass was initially treated with thyroid

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ablation, radioactive iodine, and systemic chemotherapy in conjunction with radiation therapy. . The overall goal was to reduce tumor size for symptom control or possible local surgical resection. She was subsequently admitted to another hospital for persistent cough, stridor, and pneumonia. CT imaging of the neck at that time revealed a significant pre-tracheal multinodular/mass-like thyroid enlargement causing upper tracheal narrowing and edema (**Supplementary Fig., 1*A*** and **1*B***, http://links.lww.com/CCX/B304). The patient developed respiratory failure, necessitating intubation. Two days later, she was transferred to our hospital/ICU and admitted to the HNO service. She underwent insertion of a customized Y stent and multiple endotracheal tube (ETT) exchanges. An attempt at extubation was unsuccessful due to proximal tracheal stricture and she was reintubated by the anesthesia team. At intubation, her vocal cords were visibly distorted by extrinsic tumor compression, but the anesthesiologist was able to insert the ETT using special insertion maneuvers. Complications during her prolonged course of intubation included high ventilatory requirements, stent migration with ETT cuff damage requiring stent removal and reintubation, recurrent pneumonia, and sepsis. At her husband's behest, the oncologist initially considered palliative chemotherapy, but it was later deferred, first by her husband, and then by her oncologist, due to a variety of concerns arising from patient's poor clinical status. The Head and Neck Surgery (HNS) consultant determined that a tracheostomy was unfeasible due to the mass size and location. After three months of intubation, her husband opted for a "Do Not Resuscitate" (DNR) order. She was transferred to our Step-Down Unit and developed a tracheoesophageal fistula, aspiration pneumonia, and severe sepsis and died a month later. The entirety of her 131-day hospitalization (131 of 131 d, 100%) was spent on ventilatory support.

The extended intubation was marked by heightened levels of patient anxiety. Cognizant of her condition and her family's distress, the patient frequently declined care, raising ethical dilemmas on autonomy and capacity. Her husband had to confront her complex clinical situation, lack of viable treatment options, and her deterioration. These factors fostered disbelief, frustration, mistrust, and concern for electing palliative care. The patient's husband's distress and difficulty in conveying her prognosis to their young children surfaced during several interprofessional family meetings that included supportive medicine and ethics consultants.

Patient 2

A 66-year-old fully independent woman with no medical comorbidities, was diagnosed with metastatic anaplastic thyroid cancer. Her oncologist initiated palliative chemotherapy after discussion with the patient and her family, hoping for reduction in tumor size, that would allow for potential surgical or radiation treatment. After 6 months of daily oral oncologic therapies, she presented to our hospital for progressive dysphagia and dyspnea. CT neck demonstrated an increasing infiltrative right thyroid mass causing leftward tracheal deviation and endoluminal invasion (Supplementary Fig., **2*A*** and **2*B***, http://links.lww.com/CCX/B304).

Based on these findings, interventional pulmonology (IP), HNS, and critical care medicine (CCM), were consulted. After suspending a prior DNR order, the patient was intubated in the operating room without difficulty and a bronchoscopy revealed a necrotic tumor causing 80% tracheal narrowing. IP performed endotracheal tumor debulking, balloon dilation, and tracheal stent placement. An extubation attempt in the operating room failed because of airway stridor and respiratory distress; thus, she was reintubated and admitted to the ICU with HNO as the primary service.

The HNS consultant felt that her tumor's location and extensive airway involvement precluded tracheostomy. Nevertheless, her good functional status and lack of significant comorbidities prompted 4 days of palliative radiation, in the hope of facilitating extubation. Enteral palliative chemotherapy, already prescribed before her ICU stay, could not be administered due to inability to obtain enteral access. Although intubated, she required anxiolytics, opioids for severe radiation esophagitis and dermatitis, and total parenteral nutrition for malnutrition. She was extubated after 7 days but remained in the ICU to optimize airway care. Within a week, she developed worsening stridor and was reintubated without complication by the anesthesiology team, at which point all cancer-directed therapies were discontinued. After 20 days in the hospital, including 12 days of mechanical ventilation (12 of 20 d, 60%), she was extubated with a Do Not Reintubate order, and nononcological therapies were continued.

DNR was also reestablished several days later, and her care was shifted to comfort. Respecting the patient's and her family's wish to avoid dying in a hospital setting, she was transferred from the ICU to an inpatient hospice facility, where she later died.

The patient and her family remained hopeful after intubation, choosing to proceed with palliative radiation therapy without clear prospects for improved prognosis or extubation. Throughout her hospitalization, the persistent lack of clinical improvement and the absence of a viable plan for her liberation from mechanical ventilation, whether by extubation or a long-term artificial airway, was a prominent source of frustration for both the patient and her family. Supportive medicine service counseling was enlisted to address these complex emotions.

Patient 3

A 44-year-old man was diagnosed with metastatic medullary thyroid cancer and malignant ascites. He underwent chemotherapy for 3 years and was enrolled in our hospital in a clinical trial (oral oncologic therapy) that addresses disease progression. Within 4 weeks of his last dose, he presented to our emergency department for respiratory insufficiency secondary to ongoing aspiration, rhinovirus, and COVID-19. CT neck showed a patent but narrowed and distorted airway with a large encircling thyroid mass (Supplementary Fig., **3*A*** and **3*B***, http://links.lww.com/CCX/B304).

The patient was admitted directly to the ICU, with HNO as primary service, for respiratory failure. He was promptly orally intubated without complication by the ICU Fellow with anesthesiology and HNS at bedside for potential assistance. He was treated for pneumonia and initially improved over 7 days, allowing for extubation. Subsequently he experienced acute encephalopathy and seizures, and was uneventfully reintubated by the ICU Fellow, with anesthesiology at the bedside for potential assistance. The HNS consultant felt that a tracheostomy was not feasible due to the large thyroid mass. One week later, he was extubated again but quickly experienced hypoxemic respiratory failure requiring oxygen support via a high-flow nasal cannula. After substantial deliberation, a DNR order was placed, and care shifted to comfort as both his neurologic and respiratory status worsened, and he died 3 days later. His entire 23-day stay was spent in the ICU with 15 of those days (65%) on mechanical ventilation.

The patient's bleak prognosis caused significant family emotional burden. His wife and mother conveyed frustration, sorrow over the lack of clinical improvement, and the challenge of communicating the patient's imminent death to his preschool-aged son. Although hopeful, they were torn by the desire to alleviate his suffering. The supportive medicine and social work services offered support and solace to the family.

Patient 4

A 63-year-old woman was diagnosed with anaplastic thyroid cancer with tracheal invasion and acute airway obstruction. Management included tumor debulking, radiation therapy, and IV chemotherapy aiming to reduce tumor size. Her disease course was notable for radiation dermatitis in her anterior neck and dysphagia eventually requiring a percutaneous endoscopic gastrostomy.

Within 5 weeks of her last chemotherapy, she presented to the emergency department at another hospital with fever and shortness of breath secondary to pneumonia. CT neck revealed vocal cord edema and residual tumor, and bedside laryngoscopy showed mild tracheal deviation but no significant airway obstruction. She was managed with dexamethasone and antibiotics, but ultimately required intubation. Two subsequent extubation attempts failed due to excessive secretions. Approximately three weeks after her initial intubation, she was transferred while intubated to our ICU with HNO as the primary service. The IP team performed a flexible bronchoscopy that revealed diffuse lesions extending from above the vocal cords to the midtrachea. CT neck on the same day showed an increase in the large left heterogeneous multicompartment thyroid tumor, spreading through tracheal and cricoid cartilages (Supplementary Fig., **4*A*** and **4*B***, http://links.lww.com/CCX/B304). With these findings in addition to the poor skin condition of her anterior neck secondary to radiation and concern that the tumor may recur rapidly at the tracheostomy site, HNS felt she would be a poor tracheostomy candidate and declined to move forward with a tracheostomy.

Following multiple interdisciplinary (CCM, HNS, IP, and supportive care) goals of care discussions, the patient, in conjunction with her adult children, acknowledged the extensive nature of the tumor, inability to undergo tracheostomy, and her poor prognosis, and elected for palliative extubation. She was

then extubated, and one day later developed respiratory failure. Comfort measures were instituted, and she died shortly thereafter. She was hospitalized at our ICU for 8 days and 7 of those days she was mechanically ventilated (88%).

Although intubated, she suffered severe anxiety, and the psychiatry team was consulted to assist with symptom management. The supportive care service was also instrumental in facilitating goals of care discussions and navigating her complex condition.

DISCUSSION

Managing the airway and respiratory failure in cancer patients with large and complex anterior tracheal thyroid tumors poses intricate challenges (**Table 1**), superseding even those created by anatomical and vascular neck variations (1–3). Intubation, a crucial temporizing measure, establishes an artificial airway for patients with respiratory failure and allows for oncologic treatments (i.e., transports for radiation therapy) that may be unsafe without a secure airway. However, in this cohort of patients with intrinsic airway disease due to thyroid tumors, intubation can be extremely challenging and therefore, unless emergent, should be performed by, or in collaboration with, experienced proceduralists using advanced airway maneuvers and technologies. Furthermore, obtaining a long-term airway (tracheostomy) through the neck, the next logical step in the care model of long-term airway support after intubation, whether performed by HNS, IP, or intensivists, sometimes cannot be performed, creating a conundrum for the CCM team.

The American Thyroid Association's (ATA) guidelines for treating thyroid tumors advocate for a patient-centered approach, in conjunction with specialized surgical expertise (4). The guidelines suggest that a well-executed tracheostomy, if possible, can serve as a vital component of palliative treatment and patient disposition (2, 3). Nevertheless, establishing a surgical airway carries significant risks, including difficulty in tracheal access, potential loss of the airway, perioperative bleeding, potential need for tumor debulking, and confronting altered airway anatomy (5). Even if successful, ongoing tumor progression may cause recurrent airway obstruction, bleeding, and tube dislodgement (1, 5). The ATA therefore, advocates for a collaborative and structured approach to identifying potential tracheostomy candidates, prioritizing individualized patient-centered care and shared decision-making with patients or proxies. At the same time, the ATA highlights that performing a tracheostomy in this patient group should not be routine, as it is likely to be permanent and may profoundly affect quality of life without improving outcomes (4).

Beyond the well-known complications from prolonged intubation, the absence of an airway exit strategy for the patients in this series precipitated several other CCM concerns. First, in all four cases, the CCM team perceived delays in advancing ICU care and patient disposition pending further imaging and deliberation by HNS Attending Consultants to ascertain the feasibility of tracheostomies. This situation is unusual in an ICU as tracheotomies are quite commonly, and efficiently performed when clinically indicated. In this group of patients, however, as soon as a tracheostomy was definitively ruled out as an option, multiple multidisciplinary meetings inclusive of patients and family members, were required to address risks and clinical trajectories, and decision-making to determine a path forward. Second, the prolonged occupancy of ICU and Step-Down beds by these patients, who were felt by CCM to have irreversible issues, strained ICU triage. Third, despite extensive, time-consuming discussions with the limited New York and New Jersey ventilator care facilities, our Case Managers encountered insurmountable challenges in creating a disposition plan for intubated patients, particularly those without a DNR order.

Another complicating factor for the CCM teams to address involved the ongoing deliberations among families, oncologists, and intensivists regarding the administration of oncological therapies while in the ICU. All four patients underwent either oral or IV oncologic therapies before ICU admission. These therapies were palliative, intended to reduce respiratory symptoms or facilitate possible local surgical resection. Upon ICU admission, cessation of these therapies led to expectations that these palliative agents, or radiation therapy as seen in patient two, might be continued to aid in extubation. Such hopes may have contributed to a collective reluctance among oncologists and families to transition toward comfort care. Furthermore, simply transporting intubated patients with high-risk, altered airways to the radiation therapy department presented inherent hazards. Such

TABLE 1.
Key Stressors and Corresponding Mitigation Strategies for Managing Patients With Large Anterior Tracheal Tumors in Respiratory Failure, Mechanical Ventilated, and Tracheostomies are not Feasible

Stressors to Critical Care Medicine Team	Mitigation Strategies
Clinical management	
Initially intubating in the setting of oncologically based airway abnormalities	Early identification of potentially anatomically difficult airways and engaging expert airway proceduralists for assistance
Potential complications of prolonged intubation	Actively monitor oral cavity, facial skin integrity, airway, and endotracheal tube. Adjust sedation to maintain comfort
Administering oncologic therapies with minimal benefit	Multidisciplinary assessment of risks and benefits of oncologic therapies
Ongoing conversations about goals of care without clear results	Early integration of supportive staff (supportive care, patient representative, social worker, and ethics consultant)
Care coordination	
Developing consensus regarding performance of tracheostomy	Obtain early direct visualization and diagnostic imaging and foster communication between ICU, oncology, surgical teams, and patient and proxies
ICU bed management for patients with irreversible conditions	Collaborate with nursing, consult services, and step-down units to optimize ICU bed use
Safe transport of intubated high-risk airway patients to off-ICU oncologic treatment areas (i.e., radiation therapy)	Coordinate and plan with nursing, respiratory therapists, anesthesia, and off-ICU oncologic treatment team
Discharge planning for intubated patients with or without Do Not Resuscitate status	Work with case management (i.e., transfer coordinator) for patient transfer to long-term care facility
Psychosocial	
Emotional distress in patients and families during extended stays with probable unfavorable outcomes	Engage support specialists including palliative/supportive care, social work, and patient representative
Overcoming distrust in medical services by patients and families	Initiate early, multidisciplinary, transparent discussions about realistic clinical trajectories with patients or proxies
ICU staff burnout from caring for intubated conscious patients with poor prognosis	Maintain a supportive environment for staff well-being
Staff moral distress from participating in potentially inappropriate care	Prompt recognition of high-risk patients and clinical situations that warrant early emotional support for ICU staff

risk-benefit scenarios require careful interprofessional coordination and planning amongst CCM providers, nurses, respiratory therapists, and as needed the anesthesiology team.

Fortunately, we did not have major disagreements with the primary oncology services over the administration of potentially inappropriate oncologic care, although such situations may arise. Had these occurred, the frustrating circumstances of the inability to secure long-term airway would have been magnified by disagreements over oncological therapies, with its attendant stressors to ICU team members (6–10). A multiprofessional CCM society policy statement has been published to assist in resolving treatment conflicts in the ICU (11).

The unrelenting distress, anxiety, and frustration burdening the patients and their families were amplified by prolonged hospitalization and extended duration of intubation (ranging from 60% [12 of 20 d] to 100% [131 of 131 d]), physical discomfort, distrust in medical services and interminable interprofessional meetings. The emotional weight carried by the

family and CCM staff members was particularly troubling when the patients' mental status was preserved allowing for positive and enriching family interactions, especially with their young children. However, encounters with cognitively intact patients may lead family members to underestimate the severity of their loved ones' clinical conditions and the associated complications associated with prolonged intubation. The integral and ongoing support of palliative medicine, chaplaincy, social work, and ethics consultants in addressing symptom management, psychosocial care, and advanced planning proved invaluable. In the first three patients, the goals of care decisions were primarily driven by family members. In contrast, the fourth patient's highly preserved mental status was crucial in deciding a palliative approach because she fully comprehended her prognosis and, supported by her family and consultants, exercised her autonomy in determining care.

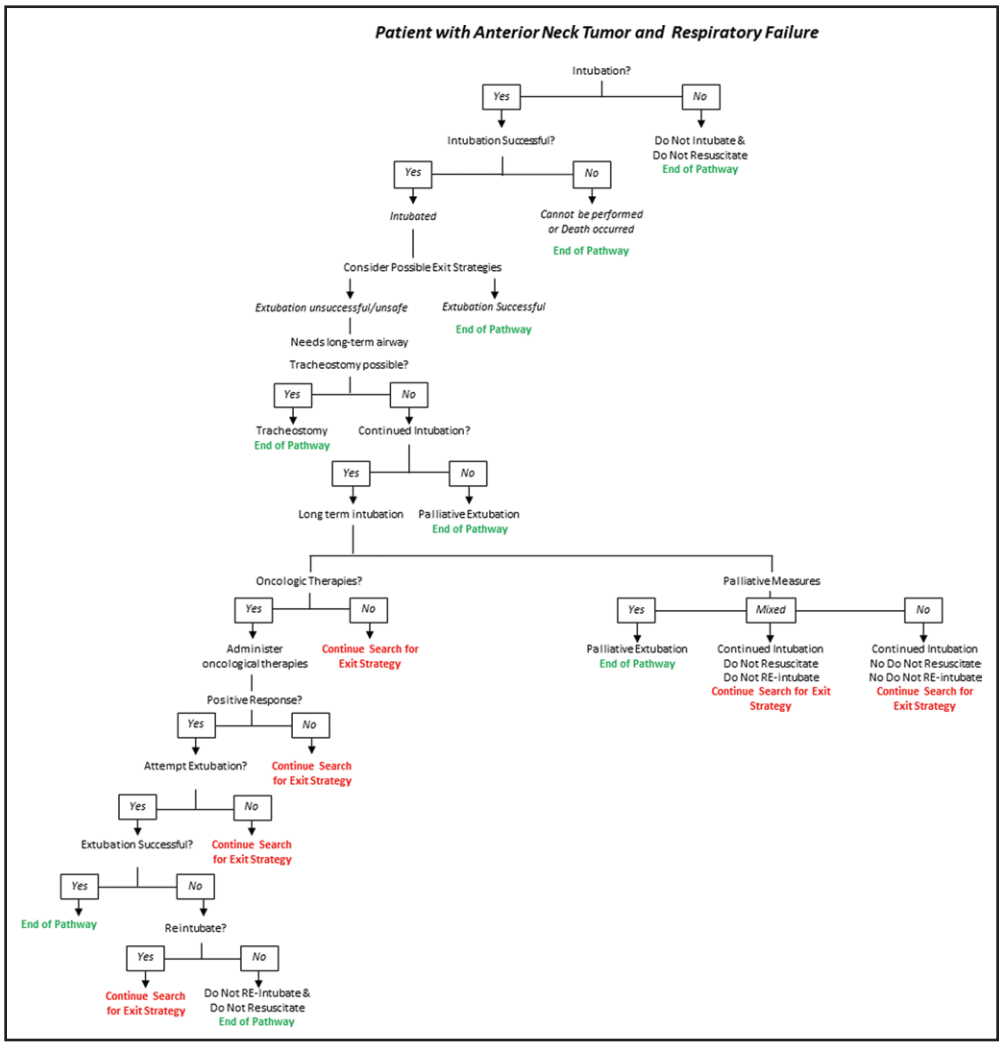

Figure 1. Algorithm for managing patients with anterior neck oncologic pathology with respiratory failure who are intubated, but unsuitable for tracheostomy. This guide highlights crucial decision-making junctures that require multidisciplinary, collaborative, and transparent decision-making with the care teams and consultants and the patient and/or proxies. Our algorithm also incorporates the potential administration of oncologic therapies which might enable extubation but are not always available or appropriate. The various pathways conclude with "End of Pathway" (green) for cessation of aggressive care or "Continue Search for Exit Strategy" (red) representing ongoing aggressive care without a viable de-escalation approach. The algorithm's many steps, and sometimes duplicative steps, reflect the challenges and complexities of care in this patient group (Table 1), and the need for iterative and time-intensive deliberations because "End of Pathway" may not signify actual treatment cessation (e.g., initial extubation success followed by later failure) and "Continue Search for Exit Strategy" reflects the ongoing discussions with patients and their proxies.

Ultimately, managing respiratory failure in cancer patients with large anterior and complex tracheal thyroid tumors demands a nuanced, patient-centered approach. Informed by our experience in caring for the patients in this case series, we propose an algorithmic approach to facilitate decision-making in such clinical scenarios (**Fig. 1**). We also outline the primary challenges in clinical management, care coordination, and psychosocial stresses affecting patients, families, and care providers, and suggest mitigation strategies (Table 1).

CONCLUSIONS

This study highlights the multifaceted challenges of clinical management in intubated patients with respiratory failure and head and neck cancers precluding tracheotomies. We hope that our experiences and proposed decision-making algorithm offer a model of care for ICU scenarios where progress stalls,

treatment plans diverge among treatment teams, and disagreement arises with patients and their families.

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