

Difficult Airway caused by a Subglottic Tumor: A Case Report

Xuefei Ye (✉ yexuefei016@163.com)

The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University
<https://orcid.org/0000-0002-3044-4177>

Xiaofeng Jiang

The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University

Haiyan Lan

The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University

Yun Yang

The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University

Qingquan Lian

The Second Affiliated Hospital and Yuying Children's Hospital of Wenzhou Medical University

Case Report

Keywords: Subglottic Tumor; difficult airway; ENT; anesthesia

Posted Date: January 30th, 2019

DOI: <https://doi.org/10.21203/rs.2.257/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Securing the airway is a core skill for an anesthesiologist, the gold standard of which is tracheal intubation. Patient with subglottic tumor is a situation of difficult airways and could be a challenge for anesthesiologists. The “cannot ventilate, cannot intubate” during anesthesia induction can be lethal. So we always prepared awake approach for diagnosed difficult airway, but awake fiberoptic intubation may be also failed.

Case presentation: In this case report we present a 55 years old female patient was scheduled for laryngeal tumor resection, and was planned awake intubation guided by fiber bronchoscope. After awake intubation attempt failed, emergency tracheostomy was successfully completed by ENT surgeon. After securing airway, general anesthesia was performed and the operation proceeded with laryngeal tumor resection.

Conclusions: It is important that ENT surgeon must be asked to remain standby for possible need of emergency tracheostomy to prevent awake fiberoptic intubation failure. Ultrasound or computed tomography scan examination of the trachea may be useful to provide guidance for anesthesiologists to choose the appropriate endotracheal tube IDs or tracheostomy directly by measuring the degree of airway stenosis.

Keywords: Subglottic Tumor; difficult airway; ENT; anesthesia

Background

Airway management is an important part of anesthesia practice, especially in patients with subglottic tumor. Subglottic tumors are rare¹, but it is a challenge for anesthesiologists to manage their airways. The American Society of Anesthesiologists (ASA) has developed guidelines for managing difficult airways, with a focus on intubation strategies and alternative airway techniques for patients with airway difficulties², but careful planning and preparation, can reduce the possibility of complications. We report the successful airway management of a difficult ventilation and intubation patient due to subglottic tumor by emergency tracheostomy when awake fiberoptic intubation failure. Patients with difficult airways may benefit from preoperative ultrasound or computed tomography scan examination of the neck to evaluate the degree of airway stenosis.

Case Presentation

A 55 years old female patient arrived in operating room for laryngeal tumor resection, with complaints of coughing, hoarseness and breathing hard for 2 years. She weighs 47 kg and is 158cm tall with BMI 19.56. Her previous medical history included hypertension with regular treatment for 3 years, and tuberculosis had cured for 8 months. No other significant cardiac, surgical or allergic histories were noted. Systemic examination, blood investigations, ECG were all normal. Airway examination relied on

laryngoscope and computed tomography scan. Preoperative laryngoscope showed a tumor located just below the right glottis (Figure 1). Computed tomography scan showed a subglottic tumor (Figure 2,3).

According to the airway examination, we planned awake intubation guided by fiber bronchoscope with tracheal tube of ID 6.0. Topical anesthesia was achieved by nasal packing with Dicaine and tracheal mucosa was anaesthetized through cricothyroid injection of Dicaine. Sedation was supplemented with 50ug fentanyl through intravenous injection. The fiberscope smoothly crossed glottis and the mass, until arriving above Tracheal juga, but the tracheal tube were difficult to insert. Therefore, we prepare to use a smaller size of tracheal tube to reattempt intubation. When we removed fiberscope, the patient were agitated, kept coughing and sat up on the operating table. At the same time, the number of SpO₂ declined progressively. Mask ventilation was ineffective and patient's SpO₂ still gradually decreased. The patient was getting more irritable, cyanotic, and SpO₂ was reduced to 40%. Then we penetrated the patient's cricothyroid with a puncture needle, removed the inner core. She can breathe a little and was calmed down. The SpO₂ gradually rised to 85%. At this point, emergency tracheostomy was successfully completed by ENT surgeon(Figure 4). After securing airway, general anesthesia was performed and the operation proceeded with laryngeal tumor resection.

Discussion And Conclusions

According to the origin, laryngeal cancer is divided into three subtypes, supraglottic, glottic and subglottic, and airway obstruction are more frequently associated with subglottic tumors³. It makes a serious problem for airway management. In this patient, we applied the algorithm for difficult airway management^{2,4,5} and rescued the patient from an emergency situation. In this situation, the airway should be secured before induction, as airway muscle tone and reflexes are maintained⁶ and respiratory function is not affected by anaesthetic. The two most common techniques are fiberoptic bronchoscopy (FOB) and awake tracheostomy, although they still take risks⁷. FOB is a gold standard for securing difficult airways, but it has its limitations in some cases. Many reasons for the failure of FOB are due to tumor invasion, bleeding or mucus, or severe upper airway stenosis resulting in loss of vision, which makes insertion of the cord of the bronchoscope impossible⁸⁻¹⁰.

Subglottic tumors include a wide variety of lesions such as papillomas, hemangiomas, myxomas, neurofibroma, fibromas, chondromas, epidermoid cancer, chondrosarcoma, and others¹¹. And it causes different degree of airway anatomy and physiological changes due to tumor invasion. Among the patients suffered from subglottic tumors, the airway anatomy may be distorted and the larynx may be deviated significantly. Despite the fact that the vocal cords could be clearly visualized, it may take several attempts or even can not pass the tip of the FOB beyond the vocal cords. These problems were due to the extreme angle produced by the laryngeal deviation¹². The number of intubation attempts also correlates with increasing risk of airway trauma and agitation. Moreover, it may be difficult to obtain good local anesthesia due to pathological reasons, and at worst, may be associated with serious and potentially fatal complications. Even in nonobstructed patients, the initial application of topical lidocaine spray to

the vocal cords can cause severe coughing followed by laryngeal spasm. Although this transient, reflex glottic closure can be tolerated by normal patients, it can be dangerous for patients whose airway diameter has been compromised¹³. Complete obstruction, hypoxia, confusion, and apnea⁹ may result in brain damage and death if the tracheal intubation is not accomplished quickly. Even if adequate local anesthesia can be achieved, the procedure itself is technically challenging. In our experience, some tumors are both vascular and fragile, prone to bleed or fragment at the slightest touch. Not only will bleeding impede vision, but blood and tumour fragments can also physically obstruct the airway. Even with the successful introduction of a fiberscope, the patient may panic and start to struggle because his airway diameter has been further reduced¹³.

In severe airway obstruction, we would have to use a paediatric size tube 4.0 or even smaller that is not of sufficient length. A tracheal tube that is too small can result in an excessive leak, inadequate ventilation, poor end-tidal gas monitoring and wastage of anaesthetic gases¹⁴.

Under these circumstances, the passage of the tube over the bronchoscope may be difficult or even impossible. So preoperative evaluation of the patient's airway with auxiliary examinations such as computed tomography scan and ultrasound¹⁵ would be particularly important, especially in the degree of airway stenosis^{16,17}. Just like the patient of this case, the narrowest airway diameter is only 3.18mm according to the preoperative computed tomography scan (Figure 5).

In this situation, if radiological imaging show that the FOB is not the most suitable choice, another technique is indicated. The technique invasive airway that can bypass the underlying obstruction, such as cricothyroidotomy or tracheostomy. The 4th National Audit Project (NAP4) in the UK emphasised on awake tracheotomy could provide a safer alternative to endotracheal intubation after anesthesia induction and should be actively considered⁷. Indications for awake tracheostomy for airway obstruction of the upper airway include: severe stridor, large tumor, fixed hemilarynx, gross anatomical distortion and larynx not visible on flexible nasendoscopy¹⁸. Awake tracheotomy should be performed on the impending airway obstruction and in a timely manner before complete obstruction occurs¹⁹. Because awake tracheotomy is life-saving, efficacious and safe method to secure an airway in these patients with a low incidence of complications^{19,20}.

In conclusion, preoperative auxiliary examination is important for predicted difficult airways, which can tell us how to choose the right size of tracheal tube. However, the placement of tracheal catheter is still high risk considering the unknown texture and nature of the tumor, the emergency awake tracheotomy should always be prepared for protecting airway.

Abbreviations

ENT: ear, nose, and throat (as a department in a hospital).

BMI: body mass index.

ECG: electrocardiogram.

FOB: fiberoptic bronchoscopy.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the participants for publication of this article and any accompanying tables/images.

Availability of data and materials

The datasets of the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

No funding was obtained for this study.

Authors' contributions

Xuefei Ye performed tracheal intubation and conducted intraoperative management, then followed-up the patient. Xiaofeng Jiang was a major contributor in writing the manuscript and Xuefei Ye provided critical revision. Haiyan Lan and Yun Yang also provided a critical revision. All authors read and approved the final manuscript submitted for publication

Acknowledgements

Not applicable

References

- 1 Sharma, D. K., Sohal, B. S., Bal, M. S. & Aggarwal, S. Clinico-pathological study of 50 cases of tumours of larynx. Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India 65, 29-35, doi:10.1007/s12070-011-0420-6 (2013).

- 2 Apfelbaum, J. L. et al. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology* 118, 251-270, doi:10.1097/ALN.0b013e31827773b2 (2013).
- 3 Li, G. et al. Adenoid cystic carcinoma of the larynx: A report of two cases. *Oncology Letters* 10, 2303-2306, doi:10.3892/ol.2015.3550 (2015).
- 4 JSA airway management guideline 2014: to improve the safety of induction of anesthesia. *Journal of anesthesia* 28, 482-493, doi:10.1007/s00540-014-1844-4 (2014).
- 5 Frerk, C. et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *British journal of anaesthesia* 115, 827-848, doi:10.1093/bja/aev371 (2015).
- 6 Canning, B. J. Reflex regulation of airway smooth muscle tone. *Journal of applied physiology* (Bethesda, Md. : 1985) 101, 971-985, doi:10.1152/jappphysiol.00313.2006 (2006).
- 7 Cook, T. M., Woodall, N. & Frerk, C. Major complications of airway management in the UK: results of the Fourth National Audit Project of the Royal College of Anaesthetists and the Difficult Airway Society. Part 1: anaesthesia. *British journal of anaesthesia* 106, 617-631, doi:10.1093/bja/aer058 (2011).
- 8 Ovassapian, A., Yelich, S. J., Dykes, M. H. & Brunner, E. E. Fiberoptic nasotracheal intubation—incidence and causes of failure. *Anesthesia and analgesia* 62, 692-695 (1983).
- 9 Shaw, I. C., Welchew, E. A., Harrison, B. J. & Michael, S. Complete airway obstruction during awake fibreoptic intubation. *Anaesthesia* 52, 582-585 (1997).
- 10 Wulf, H., Brinkmann, G. & Rautenberg, M. Management of the difficult airway. A case of failed fiberoptic intubation. *Acta anaesthesiologica Scandinavica* 41, 1080-1082 (1997).
- 11 Dahm, J. D., Sessions, D. G., Paniello, R. C. & Harvey, J. Primary subglottic cancer. *The Laryngoscope* 108, 741-746, doi:10.1097/00005537-199805000-00022 (1998).
- 12 WULF, H., BRINKMANN, G. & RAUTENBERG, M. Management of the difficult airway A case of failed fiberoptic intubation. *Acta Anaesthesiologica Scandinavica* 41, 1080-1082, doi:doi:10.1111/j.1399-6576.1997.tb04841.x (1997).
- 13 <Mason_et_al-1999-Anaesthesia.pdf>.
- 14 Shibasaki, M. et al. Prediction of pediatric endotracheal tube size by ultrasonography. *Anesthesiology* 113, 819-824, doi:10.1097/ALN.0b013e3181ef6757 (2010).
- 15 Asai, T. Emergency Cricothyrotomy: Toward a Safer and More Reliable Rescue Method in "Cannot Intubate, Cannot Oxygenate" Situation. *Anesthesiology* 123, 995-996, doi:10.1097/aln.0000000000000849 (2015).

16 Kristensen, M. S., Teoh, W. H., Graumann, O. & Laursen, C. B. Ultrasonography for clinical decision-making and intervention in airway management: from the mouth to the lungs and pleurae. *Insights into Imaging* 5, 253-279, doi:10.1007/s13244-014-0309-5 (2014).

17 Lakhal, K. et al. The feasibility of ultrasound to assess subglottic diameter. *Anesthesia and analgesia* 104, 611-614, doi:10.1213/01.ane.0000260136.53694.fe (2007).

18 Mason, R. A. & Fielder, C. P. The obstructed airway in head and neck surgery. *Anaesthesia* 54, 625-628 (1999).

19 Yuen, H. W., Loy, A. H. & Johari, S. Urgent awake tracheotomy for impending airway obstruction. *Otolaryngology-head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery* 136, 838-842, doi:10.1016/j.otohns.2006.12.012 (2007).

20 Fang, C. H., Friedman, R., White, P. E., Mady, L. J. & Kalyoussef, E. Emergent Awake tracheostomy- The five-year experience at an urban tertiary care center. *The Laryngoscope* 125, 2476-2479, doi:10.1002/lary.25348 (2015).

Figures

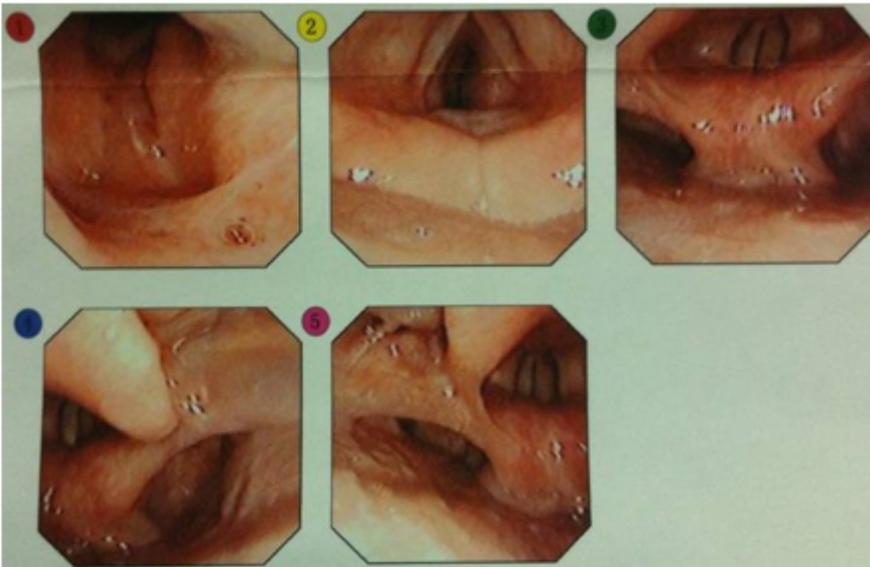


Figure 1

Preoperative laryngoscope. Preoperative laryngoscope showed a tumor located just below the right glottis.

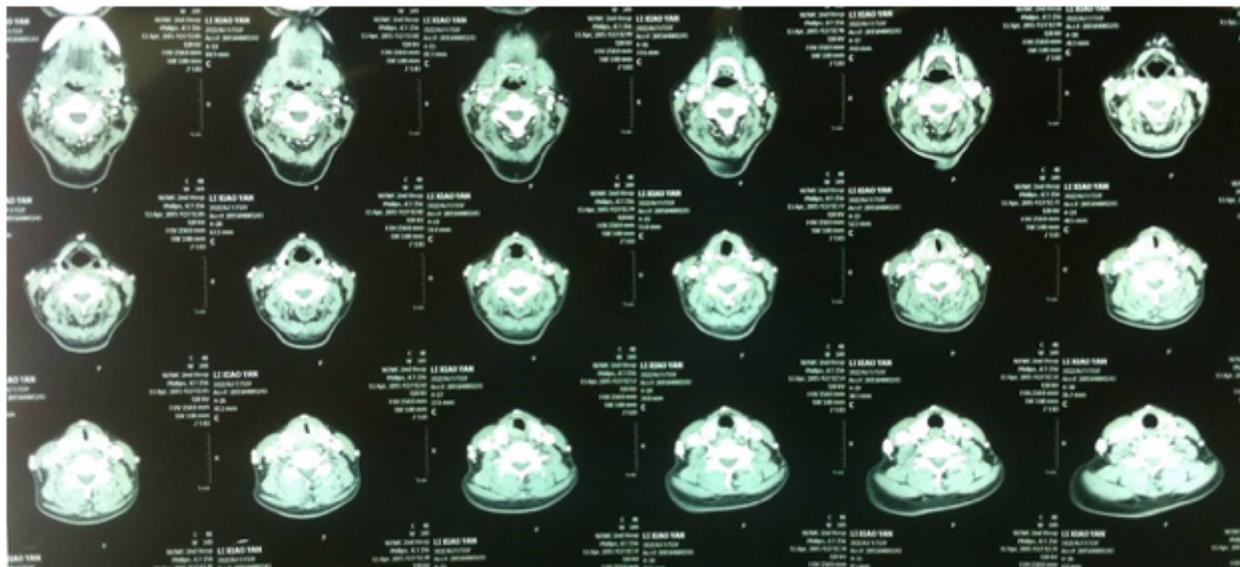


Figure 2

Preoperative computed tomography scan.

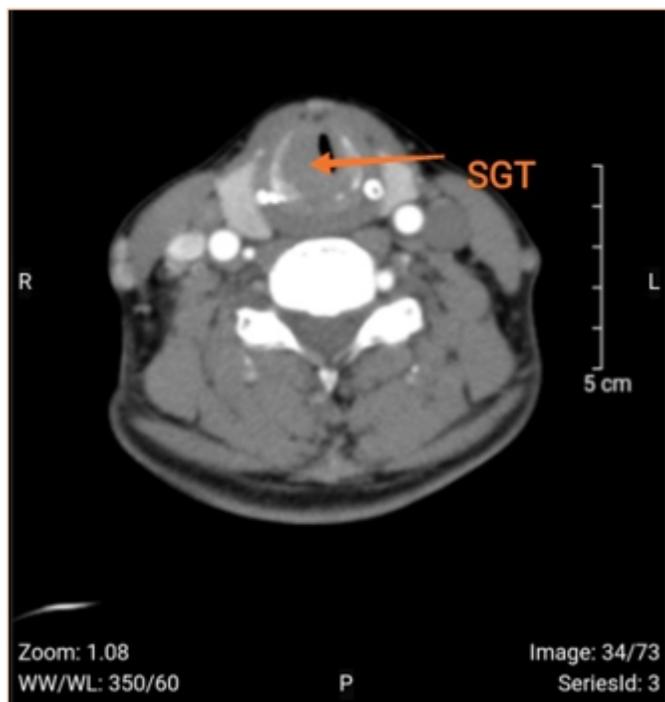


Figure 3

Computed tomography scan showed a subglottic tumor, and it caused airway obviously stenosis.



Figure 4

Emergency tracheostomy. Emergency tracheostomy was successfully performed when failed to intubate with fiber bronchoscope.

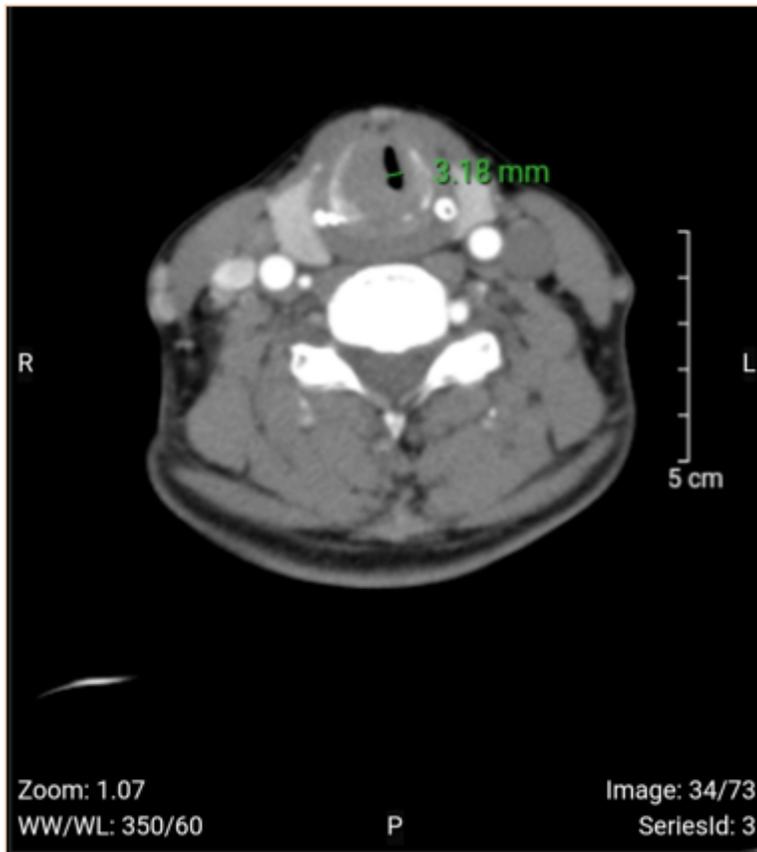


Figure 5

The computed tomography scan showed narrowest part of the airway caused by subglottic tumor was only 3.18mm.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [supplement1.docx](#)