

Introduction

Airway management in a patient with a large infiltrating mediastinal mass poses a unique challenge due to distorted airway anatomy. In addition, there is potential for central airway collapse or cardiovascular collapse with induction of general anesthesia. This challenging airway can be further complicated with superimposed vocal cord dysfunction. There are several concerns with these pathologies that may complicate the airway management plan, where awake fiberoptic intubation (FOI) should be considered. [1]

- The size and location of a mediastinal mass can preclude the use of upper airway devices, such as supraglottic airway.
- The mass or vocal cord fixation may occlude/compress the airway making passage of endotracheal tube difficult.
- If anesthesia is induced prior to securing the airway, collapse of airway structures could lead to a fatal “cannot intubate, cannot ventilate” scenario.
- Vocal cord dysfunction may be bypassed with a surgical airway, such as a cricothyrotomy/tracheotomy, however if the mediastinal mass has compressed the airway centrally, this may still not provide sufficient ventilation or oxygenation.
- Thus, optimizing the patient prior to induction and intubation, while also preparing for back-up ventilation strategies, is critical.

Here, we present a case of a patient with a large mediastinal mass and vocal cord dysfunction presenting for bronchoscopy with biopsy.

Case Description

- A 60-year-old female smoker presented to the emergency department with hoarseness, ataxia, and weight loss.
- Imaging revealed a large mediastinal mass measuring 5.3 x 4.7 x 5.7cm compressing the trachea, concerning for malignancy.
- The mass abutted the esophagus, aortic arch, right brachiocephalic and left subclavian arteries
- Patient was then scheduled for bronchoscopy with biopsy of this mediastinal mass.
- Significant mass effect and displacement of the trachea on imaging raised concerns for a safe induction and intubation plan.
- Her hoarseness raised concern for superimposed vocal cord dysfunction.
- Anesthesia team recommended a pre-operative endoscopic airway exam.
- ENT performed bedside nasal fiberoptic bronchoscopy in pre-anesthesia area. Exam revealed visible cords, however fixed position with attempted phonation.
- Decision was made to proceed with awake FOI, with ENT at bedside.

CT Images of the Airway and Chest

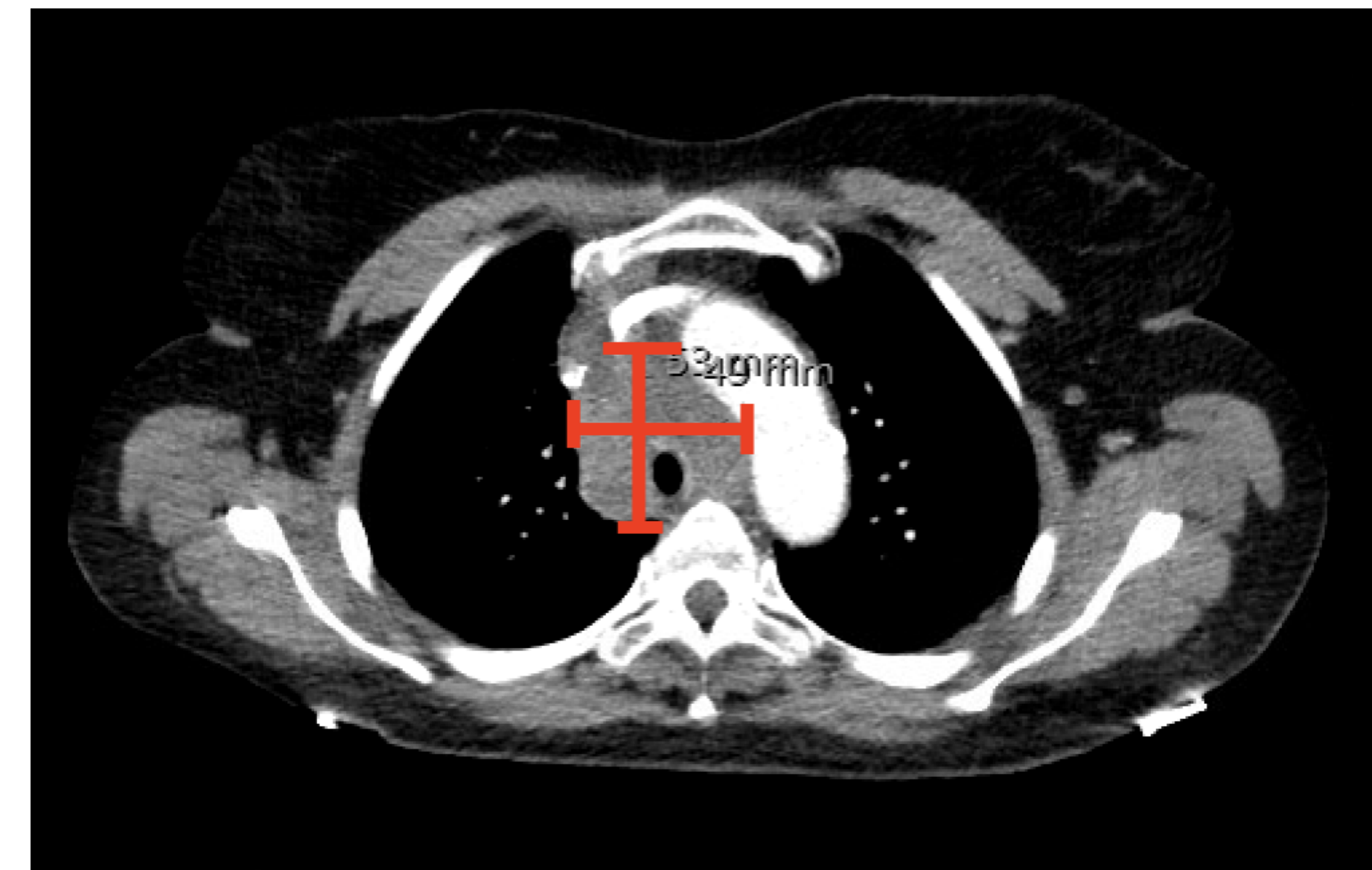


Figure 1. CT Chest with contrast revealing mediastinal mass and tracheal displacement, with abutment of great vessels.



Figure 2. CT Chest with contrast showing compression and deviation of the tracheobronchial tree

Topicalization and Difficult Airway Management

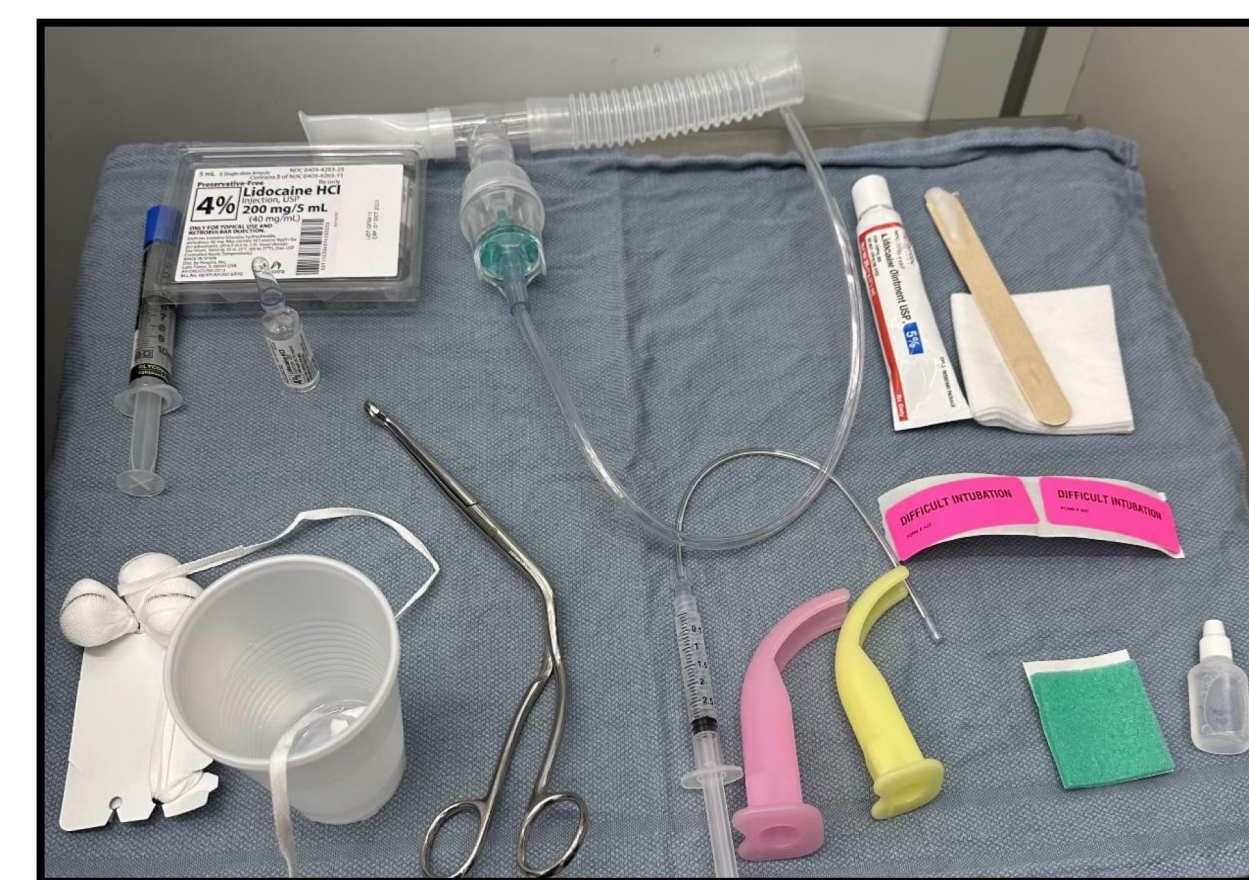


Figure 3. Nebulizer, lidocaine lollipop, lidocaine pledgets, Williams oral airway, and atomizer syringe



Figure 4. A preoperative endoscopic airway exam showed that the right vocal fold is medialized suggesting total immobility, and severe left vocal fold hypomobility at best.

- Preoxygenation was maintained via nasal cannula throughout the process of awake fiberoptic intubation
- 0.2 mg glycopyrrolate was utilized as an anti-sialagogue
- 2 mg of midazolam was administered over spaced-out intermittent boluses for anxiolysis and amnesia
- Topicalization began with nebulization of 3cc of 4% lidocaine
- 5% lidocaine ointment on a gauze-wrapped tongue depressor was slowly advanced to topicalize the posterior portion of the tongue and oropharynx – glossopharyngeal nerve
- Topicalization of the superior laryngeal nerve distribution was performed by applying 4% lidocaine-soaked cotton pledgets to bilateral tonsillar pillars
- A Williams oral airway covered with 4% lidocaine ointment was progressively advanced in the oropharynx
- 3cc of 4% lidocaine were sprayed by an atomizer syringe to topicalize the vocal cords, subglottis, and the sensory nerve endings of recurrent laryngeal nerves
- A fiberoptic bronchoscope pre-loaded with a 7.0 ETT was advanced into the supra-glottic region revealing an unobstructed view of an open glottis, with vocal cords in the fixed position
- A 7.0 ETT was advanced successfully through the vocal cords and into the trachea – this was confirmed via visualization of the tracheal rings and carina
- The patient remained in a seated upright position during this process
- Anesthesia was subsequently induced with propofol and rocuronium, and successful performance of a bronchoscopy with biopsy was conducted.

Emergence

- The patient was successfully extubated after being fully reversed, awake, spontaneously breathing tidal volumes >500cc, and following commands. ETT was removed with the patient in a recumbent position and was provided a non-rebreather face mask on 10L/min O₂ on transport to PACU.
- The patient remained stable in PACU, titrated onto room air, and was successfully discharged in a timely fashion.

Discussion and Conclusion

- Awake fiberoptic intubation remains the gold standard for management of an anticipated difficult airway [1]. In our patient, the decision to proceed with awake FOI was based on immobility of the vocal cords, with tracheal compression/ deviation by the encasing mediastinal mass. Numerous studies on awake fiberoptic intubations have found that FOI has a high rate of success (98%), low rates of serious complications (1.6%) or failure (1%), and it does not add a significant amount of time to intubation (8 minutes extra) [1].
- A preoperative endoscopic airway exam (PEAE) with nasal pharyngo-laryngoscopy helps examine airway architecture and guides further management if awake FOI is indicated [2].
- The presence of a mediastinal mass is not necessarily a direct indication for awake FOI [3], however given this patient’s severe vocal cord immobility on PEAE, in conjunction with her large mediastinal mass, led to major concerns of airway obstruction or collapse with induction of general anesthesia, which could have led to catastrophic outcomes had we not done a diligent awake FOI.
- Although difficulties were not encountered in this case, alternate airway management strategies were prepared including various sizes of micro-ETTs, video laryngoscopy, and emergency awake tracheostomy by ENT physicians, if the “can’t ventilate can’t oxygenate” scenario was encountered.

References

1. Joseph TT, Gal JS, DeMaria S Jr, Lin HM, Levine AI, Hyman JB. A Retrospective Study of Success, Failure, and Time Needed to Perform Awake Intubation. *Anesthesiology*. 2016 Jul;125(1):105-14. doi: 10.1097/ALN.0000000000001140. PMID: 27111535.
2. Rosenblatt, W., Ianus, A. I., Sukhupragarn, W., Fickenscher, A., & Sasaki, C. (2011). Preoperative endoscopic airway examination (PEAE) provides superior airway information and may reduce the use of unnecessary awake intubation. *Anesthesia & Analgesia*, 112(3), 602-607.
3. Hartigan, P. M., Karamnov, S., Gill, R. R., Ng, J. M., Yacoubian, S., Tsukada, H., ... & Blank, R. S. (2022). Mediastinal masses, anesthetic interventions, and airway compression in adults: a prospective observational study. *Anesthesiology*, 136(1), 104-114.