Management of Tracheal Deformity During Intubation: A Case Report

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Failure or difficulty in intubating the trachea can be either due to inability to visualize the glottis or some pathology at the level of or below the cords. This report describes a case of difficult intubation suspected of being related to neck scarring from previous surgery. Computed tomography (CT) was used to evaluate the patient's airway and revealed upper tracheal angulation. We describe a method to secure the airway in this patient with a two-person technique by rotating an oral endotracheal tube 180° counterclockwise to adjust to the curvature of the trachea. Problems with intubation should be anticipated in patients with scarring of the neck, and equipment for aiding intubation should be on hand. Furthermore, we found that CT contributed to the assessment of the difficulty of intubation in this kind of patient.

Key Words: difficult intubation, flexible fiberoptic bronchoscopy
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In many adult studies, the incidence of difficult intubation approximates or is less than 10% [1]. Failure or difficulty in intubating the trachea can be either due to inability to visualize the glottis or some pathology at the level of or below the cords. It results in a high probability of morbidity and mortality. To our knowledge, few articles have addressed the relationship between difficult intubation and airway distortion caused by a mature neck scar. We present a case of difficult intubation suspected of being related to a neck scar in combination with angulation of the upper trachea.

Case Presentation

A 61-year-old, 60-kg, 150-cm tall female was transferred to our orthopedic department for fixation of multiple fractures related to a motor vehicle accident. Initially, she was scheduled for emergency surgery at a local hospital, but this was unsuccessful due to failed intubation. According to her transfer notes, the preoperative examination did not reveal obvious findings that would predict difficulty with intubation. An anesthesiologist had performed the intubation as usual. Several attempts at oral and nasal intubation via laryngoscopy and flexible fiberoptic bronchoscopy (FOB) with a 6.0–7.0 mm endotracheal tube (ETT) were unsuccessful after induction. In order to avoid tracheal injury, they decided to postpone surgery.

At our hospital, she had a preanesthetic evaluation involving a thorough history and physical examination. The patient had undergone uneventful general anesthesia for a subtotal thyroidectomy 30-plus years ago, and had a transverse scar above the suprasternal notch. Routine airway examination found no abnormal finding including limitation of neck motion. Chest X-ray (anteroposterior view) revealed a well-demarcated midline trachea without narrowing. Because of insufficient evidence associated with her failed intubation, additional examinations were performed. She underwent bronchoscopy, which showed

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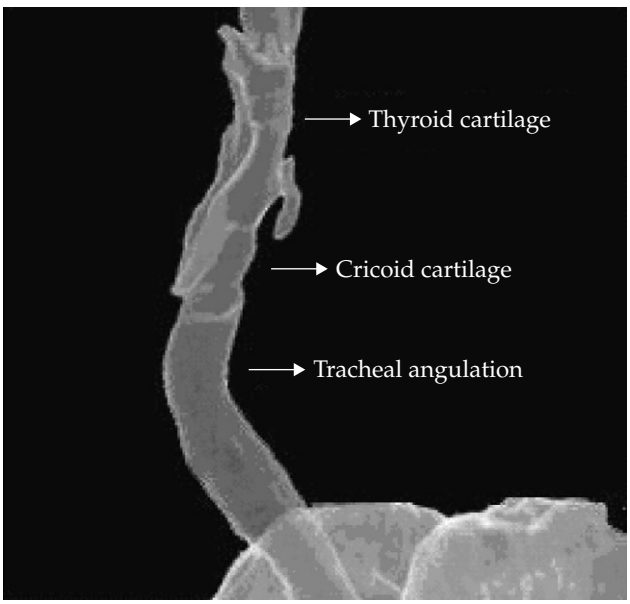

Figure. *Preoperative computed tomography image of the upper airway shows that the upper trachea is angulated.*

the following: (1) angulation of the proximal trachea; (2) no stenosis of the airway; and (3) upper trachea petechia due to several intubation attempts. Computed tomography (CT) of the neck was performed. The major finding was angulation at the upper trachea (Figure).

Before surgery, the patient had no premedication. Standard monitors were applied in the surgical suite. Due to anticipated difficulty with the intubation, instruments for aiding intubation were readily available. The patient poorly tolerated any instrumentation in her upper airway due to the previous unpleasant experience of bronchoscopy. Due to lack of patient cooperation, we decided to use general rather than local or topical anesthesia. An oral ETT was planned for the intubation due to suspected skull base fracture. She was successfully ventilated with a facemask.

The first attempt at using a long blade of direct laryngoscopy (Macintosh blade 4#) was performed under optimal conditions. The optimal view during direct laryngoscopy was scored as a modified Cormack–Lehane scoring system grade 3. We used the backward, upward, and rightward pressure (BURP) maneuver to improve laryngeal view under direct laryngoscopy, but in vain. An attempt to pass an ETT behind the epiglottis was unsuccessful.

Mask ventilation was still possible and the patient's lungs were ventilated with sevoflurane in oxygen. Oxygen saturation did not fall. We abandoned further attempts at intubation with direct laryngoscopy alone.

Then, the laryngoscope was reintroduced. It was left in the mouth and attempts were made to insert an Olympus LF-II FOB preloaded with a cuffed 7.0 mm Portex ETT into the oropharynx by a second anesthesiologist. The first anesthesiologist manually guided it under the epiglottis until the glottic opening was visualized through the fiberscope by the second anesthesiologist.

The FOB was guided into the trachea and the ETT was railroaded over the bronchoscope with some difficulty, and could not be advanced while passing the vocal cord. Under the impression of upper tracheal angulation impeding ETT advancement, we achieved successful intubation with a 180° counterclockwise turn while sticking the ETT on the trachea to accommodate the tracheal angulation with this second attempt. The trachea was then intubated orally with a 7.0 mm ETT. The patient remained hemodynamically stable throughout the procedure, with oxygen saturation greater than 98%. Anesthesia and surgery proceeded uneventfully.

Discussion

Measuring head and neck surface landmarks is a noninvasive screening method to identify patients who may experience difficult intubation. Nonetheless, unanticipated difficult intubation still occurs, as with this case. Our patient had a normal routine preoperative airway assessment except for the neck scar. Her difficulty with intubation resulted from high-grade laryngeal view and angulation of the upper trachea. We strongly suspect that mature neck scarring had resulted in distortion of the airway. To our knowledge, few articles have addressed the relationship between difficult intubation and mature neck scar, and none of them resulted from thyroidectomy.

Butler and Dhara [2] reported that external laryngeal pressure often improved the view of the glottis in difficult laryngoscopy. However, viewing the glottic inlet by laryngoscopy and with the BURP maneuver in this case, the laryngeal structure was still nearly fixed and did not improve laryngeal visualization. There was a scar on her thyroid cartilage with underlying indurated tissue from a total thyroidectomy performed over 30 years ago. Kreulen et al [3] reported that skin

contractures of the neck could cause difficult endotracheal intubation when cervical hyperextension and lifting of the mandible are impaired. A similar situation was confirmed whether the neck tissue scar formation was caused by burning or inherited skin disease [4,5]. The presence of subcutaneous contractures may not be apparent in the mature scar and functional abnormalities may be missed during routine preoperative assessment.

In all patients with scarring in the upper thorax, neck and face, preparations for dealing with difficult intubation are necessary. According to Kanaya et al [6], they suggest that prior to operation, a CT scan should be performed for this kind of patient. Using the procedure, we found angulation at the upper tracheal area in our patient. Therefore, the previous operative scar on the neck may explain the major cause of impairment of lifting mandible and distortion of the upper airway anatomy by angulation of the trachea.

When intubation by direct laryngoscopy under general anesthesia is impossible, a number of techniques are available to the anesthesiologist. The technique chosen depends on the anesthesiologist's experience and the patient's condition. FOB is our first option for its ability to be easily molded to variable airway anatomy, and as an effective alternative to direct laryngoscopy. Due to fiberoptic-aiding, intubation is often limited in the presence of secretions, and in conditions where the passage of a FOB beneath the epiglottis and into the glottic opening may prove difficult, a two-person technique might be chosen [7]. Fiberoptic intubation via the mouth is more difficult than via the nose [8]; however, for this case, oral ETT may more easily be rotated than nasal ETT to adjust to the anatomic airway distortion. Therefore, oral intubation was selected, and it was successful after the tracheal tube was rotated 180° under the guidance of the FOB.

Though the chosen procedure was uneventful, alternative methods could have been used. A method of visualizing the glottic inlet by using an intubating laryngeal mask airway combined with fiberscope intubation is preferable to other blind intubation techniques [9,10]. The McCoy laryngoscope has been reported to facilitate fiberscope-aided tracheal intubation [11]; its effect on improvement of glottic visualization is not consistent [12].

In conclusion, no matter what kind of intubation method is chosen, we suggest that when the ETT cannot pass further below the vocal cord, a simple alternative technique can be used whereby the ETT can be gently rotated to solve this problem, especially if the patient has an old neck scar.

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喉部病變之成功插管 — 病例報告

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困難插管或是插管失敗原因可能是無法看到完整的聲門或是在聲帶處或下方有病變。在此我們提出一個困難插管的病例，懷疑是因為頸部疤痕所導因，及後續處理之經驗，供大家分享。在這次的術前評估中我們採用了更精確的評估方法來了解整個呼吸道，其中包括：電腦斷層掃瞄。以上檢查顯示出既往的頸部手術造成氣管上端形成一個彎曲的角度情形。在本次的麻醉過程中我們採用雙人插管技巧 (**two-person technique**)，當光纖內視鏡順利經口腔進入到氣道中，因氣管內管較光纖內視鏡硬且具前彎之特性，卡在 **subglottic angulation** 處。最後我們試著將氣管內管逆時針旋轉 **180** 度以順應氣管彎曲的角度，終於順利將氣管內管成功置入。因此，在面對頸部有疤痕的病人，都應該考慮有困難插管的可能，並同時將各式協助插管的工具備在手邊。再者，我們也發現在這類型的病人使用電腦斷層掃瞄對評估困難插管是有幫助。

關鍵詞：困難插管，軟式支氣管鏡

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