

Original Article

Awake tracheal intubation using combination of an Airtraq® optical laryngoscope with smartphone and video flexible endoscope: a case report

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Abstract: A patient with obvious difficult airway who was received awake tracheal intubation using combination of an Airtraq® optical laryngoscope with smartphone and video flexible endoscope posted for elective surgery of tonsillectomy for OSAHS was reported. Our experiences strongly indicate that fully communication with patients, detailed preoperative assessment of airways and perfect plan, appropriate endotracheal intubation approach and devices play important roles in awake tracheal intubation in difficult airway.

Keywords: Difficult airway, optical laryngoscope, fiberoptic bronchoscope

Introduction

Obstructive sleep apnea hypopnea syndrome (OSAHS) is a sleep-related breathing disorder which is caused by recurrent collapse of the upper airway during sleep, leading to recurrent cycles of hypoxemia and arousals, and complications of the heart, lung and brain [1], and more than 44% of which are difficult airway [2]. It is awake tracheal intubation with proper preparation that is advised to manage the anticipated difficult airway according to the difficult airway management algorithm [3, 4]. However, there were sorts of complications of awake tracheal intubation [5]. Although close attention to the effective application of airway anesthesia and the judicious use of intravenous agents may help mitigate the risk of complications such as reflection of tussis, encountering blood or secretions in the oropharynx and failure of awake intubation [5, 6]. Appropriate endotracheal intubation approach and devices also play important roles in awake tracheal intubation in difficult airway. The Airtraq® optical laryngoscope (Prodol Meditec, Vizcaya, Spain) has a reusable piece that contains an optical system that transfers the image of clear view of glottis from the illuminated tip to a prox-

imal viewfinder and with no need of alignment of the oral, pharyngeal and tracheal axes [7], and a disposable rigid piece of plastic, anatomically shaped blade, and a disposable piece that is assembled on the top of the blade and which also has a proximal lens and can be substituted by a smartphone with an App named Airtraq® Mobile that can connect your phone to the Airtraq® and use air view as image display on the phone to help for intubation. It can improve the degree of Cormack-Lehane grade [8], so that it requires less force and external neck pressure during exposure and intubation than during conventional direct laryngoscopy [9, 10]. Dimitriou reported a series of cases of awake tracheal intubation using the Airtraq® laryngoscope and demonstrated that the it was effective to accomplish an awake intubation in patients with a suspected or known difficult airway with the Airtraq® laryngoscope [11]. Awake tracheal intubation is usually performed using a flexible fiberoptic bronchoscope (FOB) [12], which remains the gold standard in the management of predicted difficult intubation [4]. However sometimes the patients were uncomfortable and the awake tracheal intubation would fail to use the Airtraq® laryngoscope or FOB alone if the glottis was not easy to reach

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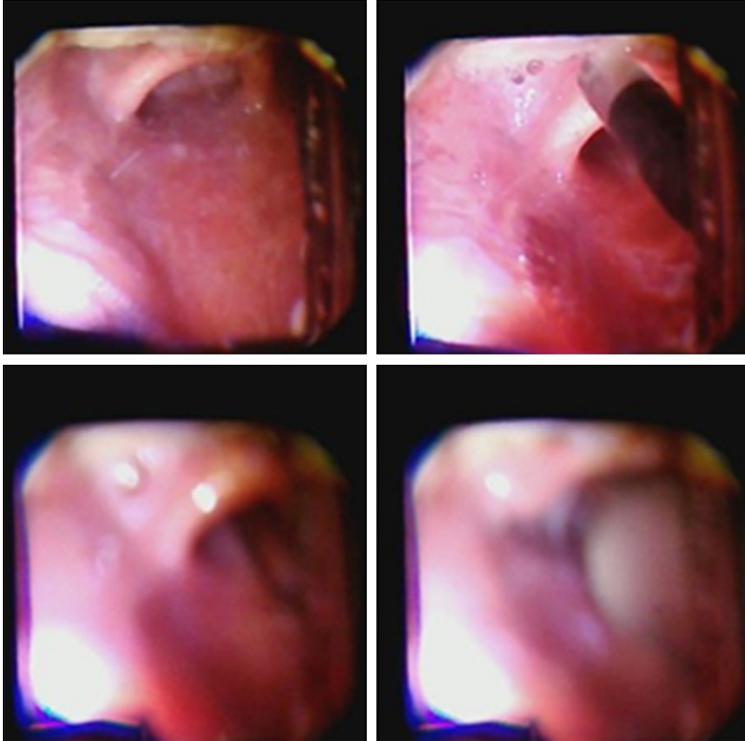


Figure 1. Preoperative airway assessment included a Mallampati grade 3 as described by Samssoon et al [13], an upper lip bite test (ULBT) class II as described by Khan et al [14], a thick neck.



Figure 2. Cricothyroid membrane puncture was performed with a 0.5×20 RW LB needle to inject anesthetic agents for topical anesthesia of airway.

And bilateral superior laryngeal nerve (SLN) block at the level of the greater horn of hyoid (GHH) was undertaken to anaesthetise the larynx. Oral mucosa and the anterior aspect of his tongue were topicalized with aerosolized 2% lidocaine.

ideal position or the vision is not clear. In that case, combined use of the video flexible endoscope (MDH A10, Guangdong, China) which is similar to FOB but is easier to operate without focusing on the ocular could improve the success rate of intubation and the comfort degree of the patients in the experience.

Case presentation

The patient was a 54-year-old man with a history of difficult airway in Tongji Hospital, Hubei, PR China. Three days ago, he was admitted with OSAHS, and had a history of failure in intubation.

On admission, he had a temperature of 36.6°C, blood pressure of 150/86 mmHg, heart rate of 78 bpm, respiratory rate of 18 bpm, weight of 75 kg, height of 155 cm, BMI of 31.2 kg/m², and O₂ saturation of 93% on room air. Initial laboratory studies of electrolytes, complete blood count and cardiac enzymes were within normal limits. EKG showed sinus heart rate, left ventricular hypertrophy. Chest radiograph showed cardiac enlargement and the two increased lung markings. Preoperative airway assessment included a Mallampati grade 3 (**Figure 1**) as described by Samssoon [13], an upper lip bite test (ULBT) class II as described by Khan et al [14], a thick neck. The patients proceeded with UPPP for OSAHS with the understanding

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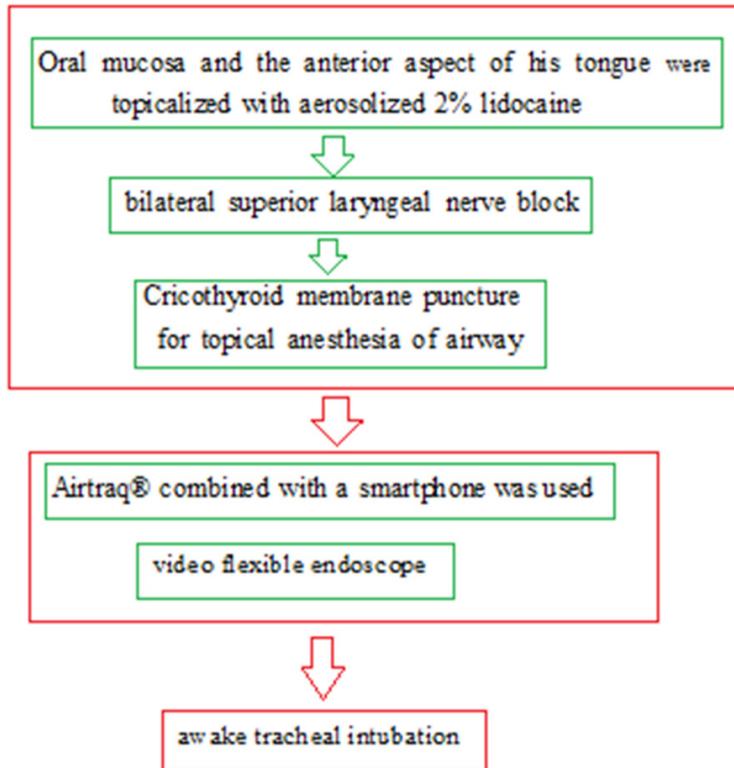


Figure 3. A schematic workflow with the Airtraq optical laryngoscope with smartphone and video flexible endoscope.

and acceptance of the risks and benefits of surgery and anesthesia.

In the operating room, the patient was lightly sedated with 40 µg intravenous dexmedetomidine. Penehyclidine hydrochloride 0.6 mg was administered intravenously for its antisialogogue action. Cricothyroid membrane puncture was performed with a 0.5×20 RW LB needle to inject anesthetic agents for topical anesthesia of airway. And bilateral superior laryngeal nerve (SLN) block at the level of the greater horn of hyoid (GHH) was undertaken to anesthetize the larynx. Oral mucosa and the anterior aspect of his tongue were topicalized with aerosolized 2% lidocaine (**Figure 2**). The Airtraq® combined with a smartphone was used to expose the glottis and his vocal cords could be partially visualized. With an assistant holding the Airtraq® in the optimal position, video flexible endoscope was advanced through the ETT and adjusted to get through the glottis. Under the visualization of the glottis on the screen of the smartphone, the ETT passed over the video flexible endoscope into the glottis. A schematic

workflow with Airtraq optical laryngoscope with smartphone and video flexible endoscope was shown in **Figure 3**. After intubation, anesthesia was induced using propofol, sufentanil and muscle relaxant and maintained with sevoflurane and remifentanyl, with no muscle relaxant added. His tonsillectomy was successfully finished. Then he left the hospital without any complication.

Discussion

Surgical operation for OSAHS such as UPPP aiming to the expanse the pharyngeal cavity is a regular choice if noninvasive continuous positive airway pressure (CPAP) that is the first-line treatment method for the ventilation treatment is not effective enough [15]. Difficult intubation that occurred more often in OSAHS patients than in controls [16] which may relate to the factors of obesity,

malformation of maxillofacial region, inflammations and malfunction of upper airway [17] was the main problem the anesthesiologists should face to during the operation. This patient had obvious signs including obese, aged, Mallampati grade 3, and history of difficult airway. And awake tracheal intubation is recommended in recognized difficult airway because the high brain damage and mortality related to intubation failure [18]. Thus awake intubation was a wise choice for him.

Awake intubation is always a challenge for both doctors and patients. First of all, full communication with patients and acquisition of their consent with the understanding and acceptance minimize the risks of awake intubation. Dexmedetomidine has the merit of arousal sedation effects without respiratory depression to provide optimum conditions during awake intubation [19, 20]. Superior laryngeal nerve block is necessary even though the combination use of the two tools produce little stimulation. And the rest of oral cavity that isn't covered by the innervations of superior laryn-

geal nerve and the airway need complete topical anesthesia to suppress vomiting and cough reflexion. Some studies recommended direct injection of anesthetic agents for topical anesthesia of airway via FOB [21, 22] against cricothyroid membrane puncture for its invasion and complications. However, it would place a higher risk of mucosal injury to keep FOB staying in the glottis or airway for the effect of anesthetics [23]. After the administration of dexmedetomidine, cricothyroid membrane puncture was performed with a 0.5×20 RW LB needle that is a proper size to avoid airway injury and long anesthetics injection. The patient presented fierce cough, facilitating homogeneous distribution of anesthetics in the airway.

Appropriate endotracheal intubation approach and devices play important roles in awake tracheal intubation in difficult airway. Fiberoptic bronchoscope (FOB) was a traditional primary and effective device used in awake tracheal intubation and was considered to “gold standard technique” [24]. Though it is an advanced method, its learning curve is steep for most residents, requiring massive training and abundant experience [25]. Recently, it was reported that using the Airtraq[®] was much easier to manage the awake tracheal intubation in difficult airway alone as an alternative to fiberoptic tracheal intubation [11, 26-28]. Because the displacement of the tongue and alignment of the oral, pharyngeal and tracheal axes are not required, less force is needed to expose the glottis and intubate [29]. Therefore the Airtraq[®] is a considerable device for awake tracheal intubation. We tried to combine the Airtraq[®] optical laryngoscope with smartphone and video flexible endoscope for awake intubation. There were several advantages as follows. The operator focus on the real-time image on the screen to maneuver the blade slightly to relative optimize position, keeping an upright posture and distance away from the patient's personal space during awake techniques [30-32]. In addition, it can handle the situation that the glottis is off-center or cannot be visualized completely by the Airtraq[®], i.e., in a Cormack-Lehane grade 3 or grade 4 view, with nearly no forceful adjustment of the Airtraq[®] to avoid the complications caused by the adjustment of the blade and reduplicative attempts of intubation [33-35]. And the guiding channel of the Airtraq[®] can provide space to avoid the collapse of the

airway impeding the visualization of the video flexible endoscope. Viewpoint switching from first person to third person and wider sphere of vision facilitate the operation. As a result, the learning curve of trainees for the video flexible endoscope skills become much faster.

In conclusion, combination of an Airtraq[®] optical laryngoscope with smartphone and video flexible endoscope is a considerable choice for awake tracheal intubation.

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Disclosure of conflict of interest

None.

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