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Kritik Hava Yolu Yönetimi için Zihinsel Model Konsepti

Mental Model Concept for Critical Airway Management

Ayten Saraçoğlu[1], Biju Kurian[1], Bushra M. Abdallah[2], Roaa Suleiman[1], Layla J. M. Kily[1], Hussain Al-Enazi[3], Yahya Paksoy[4], Kemal Tolga Saraçoğlu[1]

[1]Hamad Tıp Merkezi, Yoğun Bakım ve Ameliyathane Tıbbı, Anesteziyoloji Bölümü, Doha, Katar.

[2]QU Sağlık, Katar Üniversitesi, Tıp Koleji, Doha, Katar.

[3]Hamad Tıbbi Cihaz Kurumu, Kulak Burun Boğaz ve Baş Boyun Cerrahisi Bölümü, Doha, Katar.

[4]Hamad Tıp merkezi, Nöroradyoloji Bölümü, Doha, Katar.

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Correspondence: Bushra M. Abdallah, College of Medicine, QU Health, Qatar University, Doha, Qatar. **E-mail:** ba1902766@qu.edu.qa

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To the Editor,

Human factors are critical in managing anticipated difficult airways, which require meticulous preparation and planning. According to the NAP4 study, human factors contributed to at least 40% of adverse outcomes [1]. The study emphasized that human factor decisions can enhance technical performance. Key elements include leadership, teamwork, role allocation, and effective communication [2]. It is recommended that the most experienced anesthesiologist take on the role of leader in difficult airway management [3].

The leader plans airway management, delegates tasks, and oversees transitions. However, making critical decisions for a high-risk patient under time pressure can be mentally challenging. If not managed effectively, there is an increased risk of poor decisions, fixation errors, and airway management failure. For instance, if Plan A fails, the leader must decide when to do the transition to Plan B. Any delay in this process risks patient deterioration.

While managing a high-stress environment, the leader should not simultaneously be expected to perform technical tasks such as tracheal intubation, mask ventilation, or bougie placement, as this could delay decision-making and team coordination. To address this, our anesthesia team tailored a task distribution for managing anticipated difficult airways. The team comprised a leader, an airway operator, and two anesthesia technologists. The leader ensured patient safety, guided the team, and adapted plans, while the airway operator performed all technical tasks, including videolaryngoscopy or surgical airway management.

Our patient was an 18-year-old male diagnosed with Griscelli syndrome. Subglottic stenosis developed from repeated intubations for tracheomalacia. He had a modified Mallampati score of 3. Imaging revealed a tracheal diameter of 1.08 cm at its narrowest point, with an area of 1.16 cm² at its most constricted segment (Figs. 1–3). A peritracheal air shadow was observed alongside the trachea, and tracheoceles (pseudodiverticula) extended along the trachea up to 1 cm above the carina (Fig. 2). The patient was scheduled for a submental lymph node excisional biopsy. Clinical examination revealed submandibular swelling from lymph node infection.

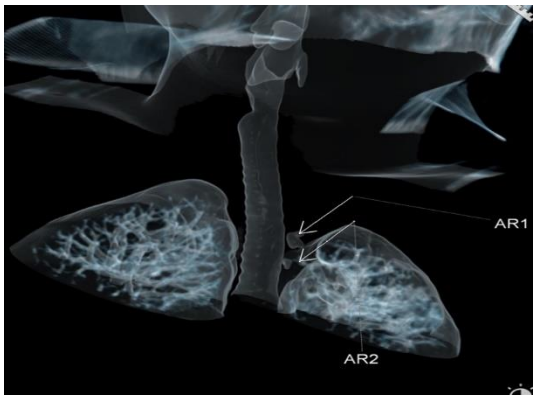

Figure 1. Virtual 3D view: Pseudodiverticula (AR1-AR2).

The airway lead and operator prepared for possible complications, including acute desaturation and airway collapse. Since a definitive airway might become necessary, a stepwise plan was developed: Plan A was awake fiberoptic orotracheal intubation, Plan B was awake videolaryngoscopy, and Plan C was awake insertion of a supraglottic airway device (SAD) followed by intubation through the device.

Before the procedure, the airway operator marked the cricothyroid membrane using ultrasonography. However, during preoperative evaluation, the airway plan was revised. Due to subglottic stenosis and

secretion risk, awake intubation was deemed unsuitable. Instead, Plan A was modified to involve dexmedetomidine sedation (0.5 mcg/kg bolus, then 0.5 mcg/kg/hr infusion). Preoxygenation was performed using high-flow nasal cannula oxygenation at 30 L/min (100% oxygen) until end-tidal oxygen exceeded 90%. A videolaryngoscope with a D blade was prepared, and Plan B was SAD-assisted ventilation.

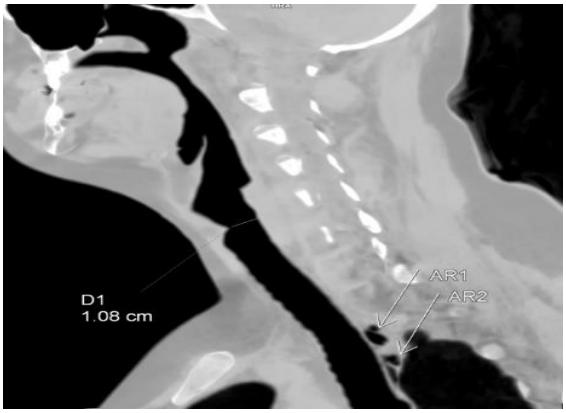

Figure 2. Sagittal sub-miNIP view: Subglottic stenosis.

Figure 3. Area of the narrowest place in the axial plan.

The team agreed to avoid intubation unless necessary, ensuring visualization of the trachea due to tracheoceles. If intubation was required, fiberoptic Aintree-guided intubation via SAD was preferred. A secondary option was the VivaSight endotracheal tube, which allows real-time tracheal visualization. The otorhinolaryngology team was on standby for emergency cricothyroidotomy in the event of a cannot-intubate, cannot-oxygenate (CICO) scenario.

Procedural sedation with dexmedetomidine was successfully implemented. All preparations were in place, but intubation and SAD placement were not needed. The airway operator remained hands-off, as no advanced airway intervention was required.

This case reinforced the importance of structured teamwork in managing complex airway challenges. As a result, our institution established a Difficult Airway Response Team (DART), composed of two specialized anesthesiologist groups.

1. Airway leads – trained in the European Airway Management Society's Train the Airway Trainers course, focusing on non-technical skills such as leadership and decision-making.
2. Airway operators – anesthesiologists with advanced airway management training who have attended workshops.

To enhance preparedness, part-task training was implemented to improve procedural skills, and cognitive skills training was provided for decision-making and team coordination [4]. Part-task training, which breaks complex tasks into smaller steps, has proven effective for teaching fiberoptic intubation [5]. Operators were trained using the part-task training method, while airway leads focused on cognitive skills training.

Through these initiatives, the DART enhances our institution's readiness for future difficult airway cases, ensuring efficient leadership and technical execution in high-risk scenarios. By fostering a mental model framework, the team is now equipped with the necessary training to act as airway operators and leaders in future clinical challenges.

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