PROBLEM-BASED LEARNING: Airway Management in Remote Area

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CASE: Airway Nightmare in A Remote Location

OBJECTIVES:

1. Increasing role of anesthesiologists in remote areas
2. Challenges of remote anesthesia care
3. Airway management in remote areas

Adverse Anesthesia Outcomes in Remote Areas
Anesthesiologists are increasingly being involved in providing anesthesia care outside of the operating room. Remote anesthesia care is often challenging with the demand of a variety of procedures. Due to cost saving and operating room time restraint, anesthesia care in the remote areas has gained immense popularity with the desire to maintain similar care as in the operating room [1,2].

Metzner et al. reported 87 claims associated with anesthesia care in remote areas, predominantly in the gastrointestinal suite, radiology and cardiology [1]. The most common cause of morbidity was adverse respiratory events; there were 18 cases of inadequate oxygenation/ventilation, six difficult intubations, eight esophageal intubations, and three cases of aspirations. Oversedation in these areas was identified to be the major determinant of respiratory adverse events. Thus, it was suggested that a general anesthesia with a secured airway may be safer than monitored anesthesia care for some of these procedures. Furthermore, the 4th National Audit Project on major airway complications reported ‘difficult or delayed intubation’, ‘aspiration of gastric contents’, and ‘failed intubation’ as major complications in the remote area [3].

Challenges in Remote Areas
Organizational and infrastructural differences outside the operating room are barriers that circumvent the familiarity and comfort of the operating room environment. These differences can impact all aspects of anesthesia care including the approach to anticipated and unanticipated difficult airways [4,5]. Due to the remote location of nonoperating room settings, one of the first principals in difficult airway management, that is to call for assistance and help, is not so obvious. Often the personnel working in these remote areas has limited training in assisting with the airway and the difficult airway cart is not readily available [6]. The different layout, limited space and access to power lines, gas supply and suction equipment add to the challenge of providing adequate anesthesia care. It is therefore imperative that adaptations to these locations must be performed in close communication with the anesthesia department [7].

Importance of Predicting Difficult Airways and Mask Ventilation in Remote Locations
An accurate assessment of the airway remains a cornerstone in airway management of the remote locations. The prediction of both difficult mask ventilation (DMV) and intubation must be elucidated in order to properly prepare for managing the airway. The fact that most anesthesia care in the remote locations does not necessitate a general anesthesia implies that an accurate prediction of difficult ventilation is paramount. In a prospective study on DMV, Langeron and colleagues [8] identified that DMV occurred in patients with at least two of the following five risk factors that included age older than 55 years, BMI more than 26 kg/m², edentulous, history of snoring, and presence of facial hair. In another study, Yildiz et al. [9] identified Mallampati class 4, male, history of snoring, age, and weight to be significantly associated with DMV. Other investigators have advocated a grading scale of DMV of four grades in ascending difficulty. Kheterpal et al. [10] observed that a ≥ BMI of 30 kg/m², a beard, Mallampati class 3 or 4, ≥ 57 years old, severely limited jaw protrusion, and snoring were independent predictors for DMV grade 3, whereas, snoring and thyromental distance ≤ 6 cm were independent predictors for DMV grade 4. A grade 3 DMV is characterized to be at risk of inadequate, unstable, or requiring two practitioners, and a grade 4 DMV predicts the inability to mask ventilate [11]. The ability to properly grade the degree of DMV is therefore crucial to optimally prepare for providing adequate oxygenation in remote areas.

In the event that a general anesthesia with trachea intubation is required, an accurate prediction of difficult intubation is critical since the remote locations often have architectural, personnel, and equipment limitations. Although there are several assessment tools that have been described [12-15], no single tool is adequate to accurately predict the difficult airway. In a large meta-analysis [16], the prognostic value of the modified Mallampati score, as a predictor for difficult intubation, was worse than previously reported. The most important individual risk factors include the Mallampati classification, head and neck movement (atlantooccipital joint assessment), mouth opening below 5 cm, receding mandibula, protruding incisors, thyromental distance below 6 cm, sternomental distance below 13.5 cm, obesity ≥ BMI of 35 kg/m² [17], and a previous history of difficult intubation [18].

**The Role of Videolaryngoscopes (VL)**

Over the last decade VL have been at the forefront of new approach to airway management. The single most important finding is that visualization of the glottis is improved with most types of VL [19]. Currently the use of VL in the remote locations is limited, while the majority of the studies was performed in the operating room setting. In situations of difficult intubation, the number of attempts is reduced with VL due to converting blind intubations into intubations under visual control. The GlideScope has a high overall success rate both as primary technique or in patients with predictors of difficult direct laryngoscopy [20]. Noppens et al. [21] showed improved first attempt intubation with the use of C-MAC compared with standard laryngoscopy. In addition, the force required to intubate with a Glidescope was significantly less than with direct laryngoscopy [22]. In situations of predicted difficult airway, the use Glidescope and C-MAC was superior to classical methods resulting in more success at first attempt [23, 24]. However, some studies demonstrated that improved glottis visualization did not necessarily translated into overall success rate of intubation. In morbidly obese patients, intubation with the Glidescope and Pentax AWS took longer time and was less successful compared to the direct laryngoscopy with the MacIntosh blade [25,26]. Although evidence is limited on the outcomes of the use of VL in remote locations, studies from the operating rooms suggest that VL may improve first attempt of intubation in patient with predicted difficult intubation [20-24].
**Summary of Airway Management in Remote Locations**

The management of difficult airways outside the operating room remains a challenge for anesthesiologists. Specific aspects related to the organization and infrastructure of these locations are barriers that must be recognized and anticipated. Therefore, a thorough evaluation of the airway remains a cornerstone in remote anesthesia care, even when providing monitored anesthesia care without airway instrumentation. The increasing use of VL in the operating room has become an important tool for airway management that appears to improve glottis visualization and first attempt intubation in patients with predicted difficult airways, although the improved visualizations do not always translate in improved intubation. While a wide variety of VL is available, this poses a potential danger from insufficient training and experience when they are needed in an emergency situation. Therefore, it is recommended that expertise in only one or two devices in a specific anesthesia service to guarantee optimal skills and experience by all practitioners involved. Finally, the standard airway guidelines remain the cornerstone of difficult airway management, although some specific aspects should be adapted in specific scenarios for anesthesia outside the operating room. The new updated ASA Difficult Airway Algorithm acknowledges the introduction of the newer video laryngoscopes as an initial approach to intubation.
References

2. Eichhorn V, Henzler D, Murphy MF. Standardizing care and monitoring for anesthesia or procedural sedation delivered outside the operating room. Curr Opin Anaesthesiol 2010; 23:494–499.


