ORIGINAL RESEARCH PAPER

Emergency Medicine

AIRWAY MANAGEMENT CHALLENGES AND INTUBATION OUTCOMES IN MORBIDLY OBESE PATIENTS: A PROSPECTIVE CASE SERIES FROM A TERTIARY CARE EMERGENCY DEPARTMENT IN NAVI MUMBAI

KEY WORDS: Morbid Obesity; Difficult Airway; Endotracheal Intubation; Airway Management; Rapid Oxygen Desaturation.

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ABSTRACT

Morbid obesity is associated with significant airway management challenges due to altered anatomy, reduced functional residual capacity, and increased prevalence of obstructive sleep apnea. We present a case series of twelve morbidly obese patients (BMI ≥ 40 kg/m²) with predictors of difficult airway, including Mallampati grade III–IV, increased neck circumference, high STOP-BANG scores, and limited mandibular protrusion. Rapid oxygen desaturation, difficult mask ventilation, and multiple intubation attempts were common findings. Airway trauma and increased risk of peri-intubation complications were observed. Early recognition of difficult airway predictors, optimal positioning, and timely use of advanced airway devices are essential to improve outcomes in morbidly obese patients.

INTRODUCTION

Obesity has emerged as a major global health concern, with its prevalence increasing steadily across both developed and developing nations. The rising burden of obesity has significant implications for emergency airway management, as obese patients frequently present with anatomical and physiological factors that complicate endotracheal intubation. Excess adipose tissue in the upper airway, increased neck circumference, limited mandibular mobility, and reduced pharyngeal space contribute to difficult laryngoscopy and airway visualization.

In addition to anatomical challenges, obese patients exhibit reduced functional residual capacity and increased oxygen consumption, resulting in rapid oxygen desaturation during periods of apnea. The presence of comorbid conditions such as obstructive sleep apnea further increases the risk of difficult mask ventilation and failed airway management. Consequently, repeated intubation attempts may lead to airway trauma, aspiration, hemodynamic instability, and potentially life-threatening "cannot intubate, cannot ventilate" situations.

Early identification of predictors of a difficult airway, including high Mallampati grade, elevated body mass index, increased neck circumference, and high STOP-BANG scores, is essential for effective airway planning. This case series highlights the challenges encountered during airway management in twelve morbidly obese patients and emphasizes strategies that may improve intubation success and reduce peri-intubation complications.

MATERIALS AND METHODS

Study Design: This study was a prospective case series conducted to evaluate airway management challenges and intubation outcomes in morbidly obese patients presenting with predictors of a difficult airway. The study focused on identifying peri-intubation difficulties, complications, and airway management strategies associated with successful endotracheal intubation.

Duration: The study was conducted over a six-month period from January 2025 to June 2025.

Location: The study was carried out in the Emergency Department of DY Patil Hospital, Navi Mumbai, a tertiary care teaching hospital equipped with advanced airway management facilities.

Sample Size: Twelve morbidly obese patients meeting the predefined difficult airway criteria were included in the case series.

Inclusion Criteria:

- Patients aged 18 years or older.
- Body Mass Index (BMI) ≥40 kg/m².
- Mallampati Grade III or IV airway.
- Increased neck circumference (>40 cm).
- High STOP-BANG score suggestive of obstructive sleep apnea.
- Limited mandibular protrusion.
- Patients requiring endotracheal intubation for emergency indications.

Exclusion Criteria:

- Patients younger than 18 years.
- Patients with major facial trauma or upper airway pathology unrelated to obesity.
- Pregnant patients.
- Patients with incomplete clinical documentation.

Data Collection:

Patient demographics, BMI, airway assessment parameters, intubation technique, number of attempts, peri-intubation oxygen saturation, airway-related complications, and clinical outcomes were recorded and analyzed descriptively.

Statistical Analysis:

Data were analyzed descriptively and expressed as means, frequencies, and percentages. Owing to the small sample size and observational nature of the study, no inferential statistical analysis was performed.

RESULTS

The study included 12 morbidly obese patients requiring endotracheal intubation, with a mean age of 55 years. Male patients constituted the majority of the cohort, accounting for 66.7% (n=8). The mean Body Mass Index (BMI) was 42.3 kg/m². Airway assessment demonstrated a mean Mallampati grade of III-IV and an average STOP-BANG score of 5, indicating a high prevalence of predictors associated with difficult airway management.

Rapid oxygen desaturation was the most frequently encountered peri-intubation challenge. The mean lowest oxygen saturation recorded during intubation was 78%, while the lowest documented saturation was 45% in a patient presenting with severe respiratory failure prior to definitive airway management. Difficult mask ventilation was observed in the majority of patients due to excess soft tissue around the face and neck, resulting in poor mask seal and impaired ventilation. Multiple intubation attempts were commonly required, with an average of two attempts per patient.

TABLE 1. Baseline Characteristics

Variable	Value
Number of Patients	12
Mean Age (years)	55
Male Sex	8 (66.7%)
Mean BMI (kg/m²)	42.3
Mean Mallampati Grade	III
Mean STOP-BANG Score	5
ICU Admission	12 (100%)
Mortality	3 (25.0%)

Direct laryngoscopy was the most commonly employed intubation technique, accounting for 66.7% of cases. Video laryngoscopy was utilized in selected patients with anticipated difficult airways. Bougie-assisted intubation was required in more than half of the cases to facilitate successful endotracheal tube placement. Airway-related trauma was observed in a small number of patients and consisted primarily of minor mucosal bleeding and airway edema.

TABLE 2. Airway Management Outcomes

Parameter	Value
Average Intubation Attempts	2
Difficult Mask Ventilation	9 (75.0%)
Bougie-Assisted Intubation	7 (58.3%)
Direct Laryngoscopy Use	8 (66.7%)
Video Laryngoscopy Use	4 (33.3%)
Airway Trauma	2 (16.7%)
Mean Lowest SpO_2 (%)	78
Lowest Recorded SpO_2 (%)	45
ICU Admission	12 (100%)
Mortality	3 (25.0%)

These findings highlight the significant airway challenges associated with morbid obesity. The observed mortality rate of 25% (3/12) was attributable primarily to the severity of the underlying critical illness necessitating intensive care admission rather than direct airway-related complications. Rapid oxygen desaturation, difficult mask ventilation, and the need for repeated intubation attempts were the most common peri-intubation complications. The frequent requirement for airway adjuncts such as bougies further emphasizes the complexity of airway management in this patient population. Early recognition of difficult airway predictors, meticulous preoxygenation, appropriate patient positioning, and timely use of advanced airway techniques are essential to improve clinical outcomes and reduce airway-related complications in morbidly obese patients.

DISCUSSION

Airway management in morbidly obese patients remains a significant clinical challenge due to a combination of anatomical and physiological factors. In our study, most patients exhibited established predictors of difficult airway, including elevated BMI, Mallampati grade III-IV airways, increased STOP-BANG scores, and difficult mask ventilation. These findings are consistent with previous studies demonstrating a strong association between obesity, obstructive sleep apnea, and difficult tracheal intubation. Juvin et al. reported a higher incidence of difficult intubation among obese patients compared with lean individuals, while De Jong et al. highlighted increased rates of airway-related complications in obese patients requiring critical care interventions.

Rapid oxygen desaturation was the most frequently encountered complication. Reduced functional residual capacity and increased oxygen consumption in obese patients result in a shortened safe apneic period, making even brief delays in securing the airway clinically significant. The frequent requirement for multiple intubation attempts and bougie-assisted intubation in our cohort further emphasizes the technical difficulties associated with airway management in this population.

Direct laryngoscopy remained the most commonly used technique; however, video laryngoscopy proved valuable in selected difficult airway cases. Difficult mask ventilation was observed in the majority of patients, reinforcing the importance of meticulous preoxygenation, optimal patient positioning, and readiness to employ advanced airway adjuncts. Although airway trauma occurred infrequently, repeated laryngoscopy attempts may increase the risk of mucosal injury and airway edema.

The study was limited by its small sample size, single-center design, and lack of a control group. Nevertheless, it underscores the importance of early airway assessment and careful planning in morbidly obese patients requiring intubation.

CONCLUSION

Morbid obesity is associated with a high incidence of difficult airway characteristics and presents unique challenges during endotracheal intubation. In this case series, rapid oxygen desaturation, difficult mask ventilation, and the need for repeated intubation attempts were the most commonly encountered complications. The frequent use of airway adjuncts such as bougies highlights the complexity of airway management in this patient population. Successful outcomes depend on early identification of difficult airway predictors, adequate preoxygenation, optimal patient positioning, and timely utilization of advanced airway devices when required. Greater awareness of these challenges and adherence to evidence-based airway management strategies may help reduce peri-intubation complications and improve outcomes in morbidly obese patients requiring emergency airway intervention.

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