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FOCUS ON: BARIATRIC

Airway management in obese patients

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SUMMARY

Airway management is often the principal concern of the majority of anaesthetists when presented with an obese patient for general anaesthesia. Many anaesthetists will be increasingly encountering obese patients requiring all types of surgery. With the expansion of bariatric surgery both worldwide and in the UK, there is now a greater evidence base to inform and guide airway management in the obese patient. This article aims to improve understanding of the term 'difficult airway' in the obese population and focuses primarily on evidence related to pre-operative airway assessment and intra-operative airway management in the obese patient.

1. Introduction

Anaesthesia in morbidly obese patients can present many challenges. The overriding concern of most anaesthetists however, is airway management, as traditionally, obese patients have been thought to be at greater risk of difficult airway and/or difficult intubation, when compared with the general population. There is plenty in the literature regarding this subject area, but the mundane is rarely reported, and so this article aims to clarify the incidence and objectively review, the evidence for difficult airway in the obese population.

The term 'difficult airway' has been defined by the American Society of Anesthesiologists (ASA) taskforce as the clinical situation in which a conventionally trained anaesthetist experiences problems with mask ventilation or tracheal intubation or both.[1] Difficult endotracheal intubation has also been defined by the ASA as more than 2 attempts at intubation or attempts lasting more than 10 min.

The literature concerning difficult intubation uses numerous different definitions of 'difficult intubation' and this lack of consensus translates to difficulty in comparing airway studies. Some authors use the Cormack and Lehane grading of 3 or 4 (C & L, grades 3–4) as an end-point to define difficult laryngoscopy and hence difficult intubation, in an attempt to simplify the issue. However 'difficult laryngoscopy' does not always equate with 'difficult tracheal intubation' and 'easy laryngoscopy' does not always equate with 'easy intubation'.

Other definitions of the difficult airway include complete failure to intubate and more than three attempts to pass the endotracheal tube. Although the view at laryngoscopy is a frequently used definition, the relationship between the number of laryngoscopies, the number of tracheal intubation attempts and the degree of post-operative morbidity has not been clearly defined.[2]

The Intubation Difficulty Scale score[3] has been used in several studies to assess difficult intubation and takes into account difficult laryngoscopic view, number of attempts required to intubate the trachea and other factors associated with difficulty. It is a validated objective scale producing a score that can be used to evaluate intubating conditions and techniques. It correlates with time to intubation and a Visual Analogue Scale (VAS) assessment of difficulty. A point is scored for each variable encountered. The variables used in the score are as follows:

N_1 – number of additional attempts;
N_2 – number of additional operators;
N_3 – number of alternative intubation techniques used;
N_4 – glottic exposure as defined by Cormack and Lehane;
N_5 – lifting force applied during laryngoscopy;
N_6 – need to apply external laryngeal pressure to improve view;
N_7 – position of vocal cords at intubation.

A summary of how the IDS score is calculated and the interpretation of this score is given in Table 1.

2. The obese airway

For the purpose of comparison with obese subjects (BMI $>$ 30 kg/m^2), the incidence of 'difficult intubation' in unselected, non-obstetric patients has been quoted as 1.8–7.5%.[2,4,5]

Comparisons are difficult because the literature is confusing with some airway studies suggest obesity to be a risk factor for

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Table 1
The Intubation Difficulty Scale.

Parameter	Score	Rules
Number of intubation attempts >1	N_1	Every additional attempt adds 1 pt
Number of operators >1	N_2	Every additional operator adds 1 pt
Number of alternative techniques	N_3	Each alternative technique adds 1 pt. Repositioning of the patient, change of materials (blade, ET tube, addition of a stylette), change in approach (nasotracheal/orotracheal) or use of another technique (fibreoptic, intubation through an LMA, etc)
Cormack & Lehane Grade-1	N_4	Apply Cormack grade for 1st oral attempt. For successful blind intubation, $N_4 = 0$.
Lifting force required: Normal	$N_5 = 0$	
Increased	$N_5 = 1$	
Laryngeal pressure: Not applied	$N_6 = 0$	Selicks manoeuvre adds no points
Applied	$N_6 = 1$	
Vocal Cord Mobility: Abduction:	$N_7 = 0$	
Adduction:	$N_7 = 1$	
Total: IDS scores = Sum of scores	N_1–N_7	NB Impossible intubation: IDS score takes value attained before abandonment of intubation attempts.

Interpretation of IDS Score	Degree of difficulty
0	Easy
$0 < \text{IDS} \leq 5$	Slight difficulty
$5 < \text{IDS}$	Moderate to major difficulty
$\text{IDS} = \infty$	Impossible intubation

difficult intubation, yet others conclude difficult intubation is no more common than in non-obese subjects. The studies vary depending upon whether they examine the association of obesity with difficult laryngoscopy alone or include other measures of difficult intubation. The findings of recent, relatively large and well-designed comparative studies looking at these associations will be briefly reported.

In a prospective study of 764 mixed surgical patients presenting for surgery, it was found that increased BMI correlated with increased Mallampati (MP) class, but not with increased grade of laryngoscopy.[6] In a controlled study of 200 morbidly obese patients undergoing elective surgery, the *magnitude* of BMI had no influence on difficulty of laryngoscopy (C & L, grade 3–4)[7] when examining the various risk factors for difficult laryngoscopy. Again, using C & L, grade 3–4 as the descriptor of difficult laryngoscopy, a recent study (Difficult Airway Society annual conference, 2008) of 397 patients with a BMI >50 kg/m^2, found an incidence of 6% to be similar to the quoted incidence for the general population.[8] Similarly, Juvin et al.[9] have previously found the incidence of difficult laryngoscopy (C & L, grade 3–4) to be the same in 134 lean (BMI < 30 kg/m^2) patients when compared with 129 obese (BMI ≥ 35 kg/m^2) patients (10.4 vs 10.1% respectively). However, the IDS score was ≥5, indicating moderate to major difficulty in intubation, in 3 lean (2.2%) and 20 (15.5%) obese patients ($P = 0.0001$). In another recent study using the IDS scoring system to prospectively compare 70 obese (BMI ≥ 30 kg/m^2) and 61 lean patients (BMI < 30 kg/m^2), the IDS score was >5 more frequently in obese compared to lean patients (14% vs 3% respectively, $P = 0.03$). This study also analysed which pre-operative measurements were associated with difficult intubation (see Section on Predictors of difficult airway below).[10]

In a large prospective, Canadian study of 18,205 non-obstetric, general surgical patients, undergoing direct laryngoscopy, there was a significantly increased proportion of overweight patients (defined as male >120 kg, female >100 kg, $n = 451$) in whom tracheal intubation was recorded as 'difficult' and who required >2 laryngoscopies before successful intubation (5.5% described as 'difficult' vs 2.4% described as 'easy', $P < 0.01$).[2]

However, Gaszynski et al. analysed the incidence of difficult intubation in 87 morbidly obese patients using the ASA definition of difficult intubation (attempts lasting more than 10 min or greater than two attempts) and found that the incidence was similar to that in lean patients (4.6%).[11]

In summary, most studies suggest that difficult intubation, if defined by difficult laryngoscopy alone, does not appear to be more common in the obese. However some well-designed studies suggest that there may be an increased incidence when including other measures to define difficult intubation, but this is dependent on which measure or definition of difficult intubation is used. It appears that the IDS score is a more objective and reliable measure of difficult intubation and has been increasingly used in studies of obese patients. Despite the difficulty in reaching a consensus from the literature, it is apparent that there are a high proportion of obese patients that do not present an 'airway problem'. However, identifying the individual factors that appear to be more closely associated with difficult intubation is paramount and these are further discussed below.

3. Predictors of difficult airway

As anaesthetists, rather than making assumptions based on BMI alone, we must aim to identify particular features in obese patients likely to predict problems with airway management. The associated features are outlined below.

3.1. BMI

It would seem intuitive that the higher the BMI, the greater the expected difficulty of intubation. However, several studies have now refuted this and BMI itself has not been shown to be an independent risk factor for difficult tracheal intubation in obese patients.[9,11,12] This suggests that the super obese (BMI >50 kg/m^2) are no more difficult to intubate than the obese or morbidly obese.

3.2. Mallampati classification

The Mallampati (MP) classification, first described by a group from Boston in 1985, uses the structures visible at the back of the mouth to predict difficult tracheal intubation.

As has been previously described, the Mallampati score has a poor sensitivity and specificity and this calls into question its usefulness in clinical practice. However, it has nonetheless become an integral part of the routine pre-operative airway assessment and the evidence for its use in obesity is considered here.

In the study by Juvin et al. a Mallampati score of 3 or 4 was the only independent risk factor for difficult intubation in obese patients with a specificity and positive predictive value of 62% and 29% respectively.[9] This reflected the findings of another study of 100 morbidly obese patients (BMI > 40 kg/m^2), where the product