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# *Prediction of Difficult Mask Ventilation*

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***Background:*** **Maintenance of airway patency and oxygenation are the main objectives of face-mask ventilation. Because the incidence of difficult mask ventilation (DMV) and the factors associated with it are not well known, we undertook this prospective study.**

***Methods:*** **Difficult mask ventilation was defined as the inability of an unassisted anesthesiologist to maintain the measured oxygen saturation as measured by pulse oximetry > 92% or to prevent or reverse signs of inadequate ventilation during positive-pressure mask ventilation under general anesthesia. A univariate analysis was performed to identify potential factors predicting DMV, followed by a multivariate analysis, and odds ratio and 95% confidence interval were calculated.**

***Results:*** **A total of 1,502 patients were prospectively included. DMV was reported in 75 patients (5%; 95% confidence interval, 3.9–6.1%), with one case of impossible ventilation. DMV was anticipated by the anesthesiologist in only 13 patients (17% of the DMV cases). Body mass index, age, macroglossia, beard, lack of teeth, history of snoring, increased Mallampati grade, and lower thyromental distance were identified in the univariate analysis as potential DMV risk factors. Using a multivariate analysis, five criteria were recognized as independent factors for a DMV (age older than 55 yr, body mass index > 26 kg/m$^2$, beard, lack of teeth, history of snoring), the presence of two indicating high likelihood of DMV (sensitivity, 0.72; specificity, 0.73).**

***Conclusion:*** **In a general adult population, DMV was reported in 5% of the patients. A simple DMV risk score was established. Being able to more accurately predict DMV may improve the safety of airway management. (Key words: Airway management; anesthesia complication; anesthesia risk; difficult intubation.)**

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DIFFICULTIES or failure in managing the airway are the major factors underlying morbidity and mortality related to anesthesia.[1] To facilitate the management of the difficult airway and to reduce the incidence of severe adverse outcomes during airway management, practice guidelines have been established,[2–4] and several algorithms have been developed. One component of many such algorithms is the preoperative assessment and recognition of the difficult airway.[2–4] Prediction is mainly based on factors associated with difficult tracheal intubation, such as mouth opening, Mallampati classification, head and neck movement (atlantooccipital joint assessment), receding mandible, protruding maxillary incisors (buck teeth), thyromental distance, sternomental distance, obesity, and a history of difficult intubation.[2–5] However, the most dangerous situation is the case in which intubation is impossible and in which mask ventilation is or becomes inadequate. The prediction of difficult mask ventilation (DMV) is therefore of vital importance. Unfortunately, the factors predicting for DMV remain unknown and have not been defined in practice guidelines for management of the difficult airway.[3,4]

## Patients and Methods

After approval by the Local Human Subjects Committee, all adult patients scheduled for orthopedic, urologic, abdominal, gynecologic and neurosurgery with general anesthesia in our hospital were prospectively included in the study over a 6-month period (October 1998–March 1999). Because no randomization was performed

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and only routine care was performed, waived informed consent was accepted by the Local Human Subjects Committee. Patients undergoing regional anesthesia and those with contraindication of mask ventilation (*i.e.*, emergency cases requiring a rapid sequence induction, planned awake intubation) were excluded.

Information was collected by the anesthesiologists on a standard form during the preoperative visit and during induction of anesthesia (appendix). During the preoperative visit, the following information was collected: (1) factors related to malproportion of overall body size (weight, height, body mass index [BMI; calculated as weight in kilograms divided by the square of the height in meters]); (2) factors that might interfere directly with external mask fit and may make mask ventilation more difficult[2,5] (receding mandible estimated on a subjective assessment, lack of teeth, and presence of beard); (3) factors related to malproportion between the oropharyngeal free space and the internal structures of the oropharynx (macroglossia estimated on a subjective assessment and Mallampati classification as modified by Samsoon and Young,[6] performed with the patient in the sitting position with the head in full extension, tongue out, and with phonation[7]; the thyromental distance [in millimeters] is measured with the patient in sitting position and head in extension,[7] and the mouth opening is measured as the interincisor distance [in millimeters]). Patients were asked if they were habitual (almost every night or every night) snorers or not. Lastly, a subjective assessment of anticipated DMV by the anesthesiologist was also requested. During the induction of anesthesia, information concerning ventilation (with 10 l/min oxygen flow) and intubation were recorded by the anesthesiologist. The anesthesiologist was asked to rate mask ventilation as difficult only when he or she considered that the difficulty was clinically relevant and could have lead to potential problems if mask ventilation had to be maintained for a longer time. The anesthesiologist was then asked to indicate the main reason(s) why mask ventilation was considered difficult: (1) inability for the unassisted anesthesiologist to maintain oxygen saturation as measured by pulse oximetry ($Sp_{O_2}$) > 92% using 100% oxygen and positive-pressure mask ventilation; (2) important gas flow leak by the face mask; (3) necessity to increase the gas flow to greater than 15 l/min and to use the oxygen flush valve more than twice; (4) no perceptible chest movement; (5) necessity to perform a two-handed mask ventilation technique; (6) change of operator required. The anesthesiologist was asked to rate mask ventilation as impossible when it completely failed, and an alternative to face mask ventilation was required in emergency conditions. Difficult intubation was defined as a proper insertion of the endotracheal tube with conventional laryngoscopy requiring more than two attempts or more than 10 min.[4] Data collected concerning tracheal intubation were use of paralyzing agents, characterization of tracheal intubation (easy, difficult, or impossible), and grading of the best laryngoscopic view according to the Cormack and Lehane classification.[8] To minimize uncertainty and inaccuracy of numerical grading system,[9] schematic diagrams were provided for classification of the view of the oropharynx and of the glottis, according to Mallampati as modified by Samsoon and Young[6] and to Cormack and Lehane[8] classifications in the data chart (Appendix).

In our institution, the routine procedure for tracheal intubation was standardized. The patient's head and neck were placed in an optimal position (the sniff position)[10] to improve laryngoscopy and intubation outcome. Preoxygenation of each patient during 4 min by bag and mask with 100% $O_2$ was required. Each patient was routinely monitored during the whole procedure by electrocardiography, $Sp_{O_2}$ and end-tidal carbon dioxide tension. After intubation, the correct positioning of the endotracheal tube was confirmed by the anesthesiologist using bilateral auscultation of lungs and detection and curve analysis of carbon dioxide in the exhaled gas. In this study, all mask ventilations and endotracheal intubations were performed by a staff anesthesiologist.

### *Statistical Analysis*

Data are mean ± SD. Main percentages were provided with their 95% confidence intervals (CIs). Univariate comparison between patients with or without DMV was performed using the unpaired Student *t* test or Fisher exact method when appropriate. In addition, receiver-operator-characteristic (ROC) curves were used to judge the discrimination ability of various clues to predict DMV. The area under the ROC curve represents the probability that a randomly chosen patient with DMV is correctly ranked for a given risk factor with greater suspicion than a randomly chosen patient without DMV (*i.e.*, the area value of 0.5 means no apparent accuracy to predict DMV, and the area value of 1 indicates a perfect accuracy to predict DMV).[11] Moreover, for significantly different continuous variables in the univariate analysis, the ROC curve was analyzed to determine the best threshold that maximized the sum of sensitivity and specificity to obtain the best diagnostic accuracy. Then,

**Table 1. Difficulties Encountered during Mask Ventilation in 75 Patients**

| Variable | n (%) |
|---|---|
| Important gas flow leak from the face mask | 42 (56%) |
| Necessity to perform a two-handed mask ventilation technique | 36 (48%) |
| Necessity to increase the gas flow above 15 l/min and to use oxygen flush valve more than twice | 24 (32%) |
| No perceptible chest movement | 18 (24%) |
| $Sp_{O_2} < 92\%$ | 11 (15%) |
| Change of operator required | 9 (12%) |
| One variable | 38 (51%) |
| Two variables | 21 (28%) |
| Three or more variables | 16 (21%) |

all dichotomous variables were analyzed using a stepwise forward logistic regression. The odds ratios and their 95% CIs were calculated. Lastly, the DMV prediction score was established with the ROC curve analysis to determine the number of criteria that had to be retained to obtain the best score accuracy. All comparisons were two-sided, and a $P$ value $< 0.05$ was considered significant. Statistical analysis was performed on a computer using NCSS 6.0 software (Statistical Solutions Ltd., Cork, Ireland).

## Results

A total of 1,502 patients were included in this study. Six hundred thirteen patients (41%) were scheduled for abdominal surgery, 474 patients (31%) for orthopedic surgery, 214 (14%) for gynecologic surgery, 130 (9%) for neurosurgery, and 71 (5%) for urologic surgery. DMV was reported in 75 patients (5%; 95% CI, 3.9–6.1%), with only one case of impossible ventilation. DMV was characterized by six possible difficulties, and its occurrence is presented in table 1. Characteristics of patients with or without reported DMV are listed in table 2.

Anticipation of DMV by the anesthesiologist during the preoperative visit was not accurate because it was predicted in only 17% (95% CI, 9–26%) of the patients with DMV, and 56 patients (4%) were predicted to have DMV but did not (table 2). This entire subjective prediction had a sensitivity of 0.17 and a specificity of 0.96, with positive and negative predictive values of 0.19 and 0.96, respectively.

In the univariate analysis, several risk factors for DMV were identified. BMI, age, Mallampati class, thyromental distance, macroglossia, lack of teeth, beard, and snoring history were significantly different between the two groups, with or without DMV (table 2). In contrast, mouth opening, occurrence of receding mandible, and use of paralyzing agents were not significantly different between the two groups (table 2). The areas under the ROC curve were $0.71 \pm 0.11$ ($P < 0.05$) and $0.68 \pm 0.10$ ($P < 0.05$) for BMI and age, respectively. The thresholds that maximized the sum of sensitivity and specificity were 26 ($kg/m^2$) for BMI and 55 (yr) for age.

**Table 2. Comparison of Patients (n = 1,502) with or without Difficult Mask Ventilation (DMV)**

| | No DMV (n = 1,427) | DMV (n = 75) | $P$ value |
|---|---|---|---|
| Height (cm) | 167 ± 10 | 168 ± 10 | NS |
| Weight (kg) | 68 ± 14 | 82 ± 20 | <0.001 |
| Body mass index ($kg/m^2$) | 24.5 ± 4.5 | 29.0 ± 6.8 | <0.001 |
| Age (yr) | 50 ± 16 | 60 ± 15 | <0.001 |
| Sex (Male) | 634 (44%) | 37 (49%) | NS |
| Mallampati Class | | | |
| 1 | 775 (54%) | 24 (32%) | |
| 2 | 466 (33%) | 34 (45%) | 0.02 |
| 3 | 140 (10%) | 13 (17%) | |
| 4 | 46 (3%) | 4 (5%) | |
| Mouth opening (mm) | 46 ± 9 | 46 ± 11 | NS |
| Thyromental distance (mm) | 89 ± 16 | 85 ± 13 | 0.002 |
| Macroglossia | 82 (6%) | 13 (17%) | <0.001 |
| Receding mandible | 73 (5%) | 3 (4%) | NS |
| Lack of teeth | 137 (10%) | 19 (25%) | <0.001 |
| Beard | 49 (3%) | 9 (12%) | 0.002 |
| History of snoring | 311 (22%) | 34 (45%) | <0.001 |
| Anticipated DMV | 56 (4%) | 13 (17%) | <0.001 |
| Paralyzing agent use | 672 (47%) | 42 (56%) | NS |

Data are mean ± SD or number (percent). NS = not significant.
Because of rounding, adding percentages may not provide a sum of 100%.

In the multivariate analysis, the following criteria were found to be significantly associated with DMV: age older than 55 yr, BMI $> 26$ $kg/m^2$, lack of teeth, history of snoring, and presence of a beard (table 3). Moreover, no type of difficulties encountered during mask ventilation and listed in table 1 was significantly associated with a

**Table 3. Identification of Risk Factors for Difficult Mask Ventilation with Multivariate Analysis (n = 1,502)**

| Variables | Odds Ratio (95% CI) | $P$ Value |
|---|---|---|
| Presence of beard | 3.18 (1.39–7.27) | 0.006 |
| Body mass index $> 26$ $kg/m^2$ | 2.75 (1.64–4.62) | <0.001 |
| Lack of teeth | 2.28 (1.26–4.10) | 0.006 |
| Age $> 55$ yr | 2.26 (1.34–3.81) | 0.002 |
| History of snoring | 1.84 (1.09–3.10) | 0.02 |

CI = confidence interval.

**Table 4. Comparison of Intbated Patients (n = 1,374) with or without Difficult Mask Ventilation (DMV)**

| | No DMV (n = 1,305) | DMV (n = 69) | *P* Value |
|---|---|---|---|
| Cormack and Lehane grades | | | |
| 1 | 987 (76%) | 31 (45%) | |
| 2 | 205 (16%) | 14 (20%) | <0.001* |
| 3 | 80 (6%) | 12 (17%) | |
| 4 | 33 (2%) | 12 (17%) | |
| Difficult intubation | 106 (8%) | 21 (30%) | <0.001 |
| Impossible intubation | 7 (0.5%) | 4 (6%) | 0.001 |

Data are mean ± SD or number (percent). NS = not significant.

* Comparison between Cormack grades 1 and 2 *versus* 3 and 4.

Because of rounding, adding percentages may not provide a sum of 100%.

specific and independent risk factor identified in the multivariate analysis, despite a tendency without reaching statistical significance ($P = 0.06$) between $Sp_{O_2} < 92\%$ and history of snoring.

Among patients who were intubated (n = 1,374), difficult intubation and Cormack and Lehane grades III and IV occurred significantly more frequently in patients with DMV (table 4). Difficult intubation and impossible intubation were, respectively, fourfold and 12-fold more frequent in patients with DMV (table 4). Moreover, the incidence of a difficult ventilation–difficult intubation and difficult ventilation–impossible intubation scenarios were 1.5% (95% CI, 0.9–2.1%) and 0.3% (95% CI, 0–0.6%), respectively (table 4).

The risk factors identified in the multivariate analysis and listed in table 3 were pooled together to determine the DMV prediction score (table 5). The number of retained criteria in the DMV prediction score associated with the best sensitivity and specificity was two (table 5 and fig. 1). We also tried to use a weighted score (using the odds ratio), but the accuracy was not significantly improved as compared with the nonweighted score (data not shown).

**Table 5. Diagnostic Value of the Number of Criteria in Predicting a Difficult Mask Ventilation (DMV)**

| Number of Criteria | Sensitivity | Specificity | Positive Predictive Value | Negative Predictive Value |
|---|---|---|---|---|
| 1 | 0.92 | 0.38 | 0.07 | 0.99 |
| 2 | 0.72 | 0.73 | 0.12 | 0.98 |
| 3 | 0.35 | 0.91 | 0.17 | 0.96 |
| 4 | 0.07 | 0.99 | 0.24 | 0.95 |
| 5 | 0.00 | 1.00 | 0.00 | 0.95 |

The criteria of the DMV prediction score were the following: age older than 55 yr, body mass index > 26 kg/m$^2$, lack of teeth, history of snoring, and presence of a beard (n = 1,502).

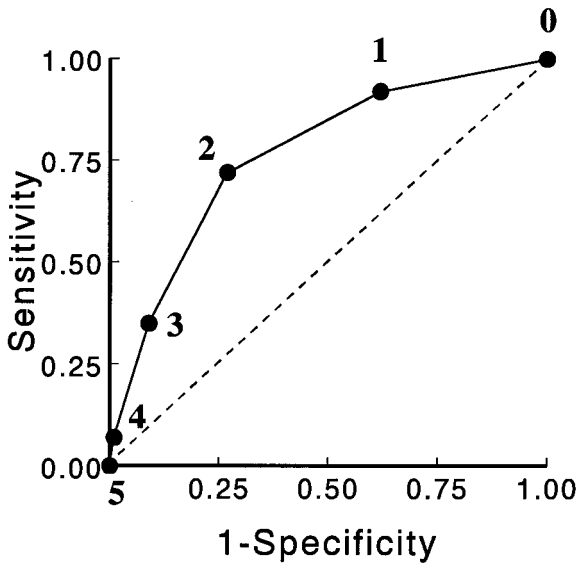


**Fig. 1. Receiver operating curve (ROC) showing the relationship between sensitivity (true positive) and 1-specificity (true negative) in determining the predictive value of the number of criteria (1 to 5) for difficult mask ventilation. The area under the curve was 0.76 ± 0.11 ($P < 0.05$). The chosen threshold was n = 2 criteria, which provided a sensitivity of 0.72 and a specificity of 0.73.**

## Discussion

In the current study, we made the following observations: (1) the reported incidence of DMV was 5%; (2) DMV was reported more frequently when intubation was difficult; (3) anesthesiologists did not accurately predict DMV during the preoperative visit; and (4) five criteria (age older than 55 yr, BMI > 26 kg/m$^2$, lack of teeth, presence of a beard, history of snoring) were independent risk factors for DMV, and the presence of two of these risk factors indicated a high likelihood of DMV (sensitivity, 0.72; specificity, 0.73).

Incidence of DMV has been rarely assessed in studies related to the airway management,[12–15] and no previous specific studies regarding difficulty with mask ventilation alone have been performed.[2,4] This may partly explain the discrepancies between our study and previous studies.[12–15] Lower rates of DMV have been reported in prospective studies by Asai *et al.* (1.4%),[12] Rose and Cohen (0.9%),[13] and El-Ganzouri *et al.* (0.07%).[14] In contrast, in a retrospective study of 2,000 incident reports during anesthesia, DMV incidence reached 15% when a difficult intubation occurred.[15] No precise definition of DMV was effectively provided in most of these studies,[12,13,15] and $Sp_{O_2}$ was not recorded in the study by El-Ganzouri *et al.*[14] We may assume that these discrep-

ancies were related to the lack of a standardized definition for DMV.

Difficult mask ventilation occurs significantly more frequently in cases of difficult intubation.[13–15] In our study, we also observed a significantly higher incidence of difficult intubation in patients with DMV (30%) compared with those without DMV (8%). Our finding agrees with the 30% DMV incidence reported in a prospective audit of failure to intubate the trachea in a maternity unit.[16] Incidence of difficult ventilation or intubation depends on the definition used,[17] but we may assume that when the difficult ventilation–intubation scenario is specifically investigated, either retrospectively[15] or prospectively,[16,18] the incidence could be much greater than that previously reported.[2] In addition, previous estimates of difficult ventilation–intubation situation came from serious incident reports with brain damage or death, probably underestimating this incidence. In our study, we determined that a difficult ventilation–intubation situation occurred in 1.5% of cases, an incidence much greater than that previously reported (0.1%) in a prospective study.[18] However, as the authors mentioned,[18] their incidence of difficult ventilation–intubation scenario could have been underestimated because their study was based on self-reporting of adverse events by anesthesiologists, and the definition used for DMV was restricted to a peripheral oxygen saturation $\leq$ 90% without associated clinical signs of DMV, as was suggested by the American Society of Anesthesiologists practice guidelines for management of the difficult airway to define DMV.[3]

In our study, DMV was anticipated by the anesthesiologist during the preoperative visit in only 17% of the DMV cases. Asai *et al.*[12] reported that, in patients in whom ventilation through a face mask was difficult, no airway problems had been anticipated before induction of anesthesia in 57% of cases. In our study, the use of muscle relaxants was equally reported when ventilation was easy or difficult (table 2), as previously reported by Rose and Cohen.[13] These results support the need to identify predicting factors for DMV, to decrease the incidence of unexpected difficult ventilation after induction of general anesthesia, and to make more discerning use of muscle relaxants.

A BMI $>$ 26 kg/m$^2$ and a history of snoring were risk factors for DMV (table 3). A reduced posterior airway space behind the base of the tongue is associated with an increased BMI, impairs the airway patency during sleep, and is therefore an important risk factor for obstructive sleep apnea syndrome.[19] Moreover, upper airway obstruction can occur after induction of general anesthesia with posterior displacements of the soft palate, base of tongue, and epiglottis, and attempts at inspiration during anesthesia caused major secondary collapse of the pharynx with multiple site of obstruction, similar to that found in obstructive sleep apnea.[20] Consequently, in patients with a moderately increased BMI and unsuspected anatomic upper airway abnormalities related to obstructive sleep apnea, DMV may occur during general anesthesia, whereas an increased risk of difficult tracheal intubation may also exist.[21] In contrast, in morbidly obese patients (BMI $>$ 40 kg/m$^2$), because oxygen desaturation after induction of anesthesia[22,23] and difficult intubation[24,25] risks are increased and feared, the likelihood of a difficult airway management is usually suspected before anesthesia, and the patient is intubated while awake.[2–4] Consequently, in patients with a slight increased BMI, the difficult airway may not be anticipated, as in morbidly obese patients, leading to a more difficult airway management than it should be with the degree of awareness. Age has been found to be closely correlated with an increased pharyngeal resistance to airflow (from choanae to epiglottis) in men but not in women,[26] supporting the predominance of obstructive sleep apnea in men. In our study, age older than 55 yr was a significant risk factor for DMV, independently of gender. Lack of teeth and the presence of a beard were also associated with DMV, decreasing the airtight seal of the face mask and increasing air leakage around the mask with a more difficult positive-pressure ventilation.[5] Consequently, these five criteria should be included in the preoperative airway assessment to better predict DMV and to detect a difficult ventilation–intubation scenario.

The finding of a distinct hierarchy of independent risk factors for DMV (table 3) is important to consider because some of them can be reversed, and thus DMV may be prevented by simple precaution: to shave a beard, to lose some weight, or not to remove dentures before induction of anesthesia. These points deserve further studies to be confirmed, considering that these risk factors could be reversible more efficiently and rapidly in decreasing order as follows: improvement in the external mask fit, decrease in the malproportion of overall body size, and decrease in malproportion between the oropharyngeal free space and the internal structures of the oropharynx.

Because five variables were independent predictors of DMV, we attempted to define a simple DMV prediction score. We observed that the presence of two criteria was

the most accurate evidence of DMV with a sensitivity of 0.72 (table 5 and fig. 1), despite a low positive predictive value being related to the relatively low incidence of DMV and with consequently a high negative predictive value (table 5). DMV prediction score is easy to perform and is established with objective criteria that are probably not operator-dependent. Moreover, as we investigated the subjective assessment of an anticipated DMV by the anesthesiologist, we observed that this screening test had a much lower sensitivity (0.17) than the one of the DMV prediction score with two criteria (0.72). Thus, this simple DMV prediction score permits a simple warning of a high-risk situation for difficult airway and potentially a better anticipated airway management.

The following points must be considered in the assessment of the relevance of our study. First, it must be recognized that the definition of DMV was subjective in our study. However, the anesthesiologist was considered as an expert able to recognize the occurrence of a clinically relevant DMV and had to precisely indicate the main reason(s) why mask ventilation was considered difficult (Appendix). This sequence of steps—first, reporting a case of DMV by the anesthesiologist, and second, retrospectively classifying the type of difficulties encountered during mask ventilation—may have underestimated the incidence of reported DMV. The lack of an independent observer to report DMV could also have underestimated its incidence in our study; however, before initiating the study, we considered that relying on the anesthesiologist in charge of the patient care was the best pragmatic approach. Second, we performed this study in a general adult population with various types of scheduled surgery. These results cannot be extrapolated to a pediatric population or high-risk populations for difficult intubation, such as ear/nose/throat, obstetric, or emergency patients. Third, the incidence of impossible ventilation was very low, and consequently this phenomenon could not be analyzed and its risk factors could not be identified. Patients with low pulmonary compliance or high airway resistance, related to a laryngospasm or a bronchospasm, have an increased risk of DMV without any predicting factors of DMV, as we described in our study. Fourth, the DMV prediction score provides an initial assessment of mask ventilation without any previous attempts of intubation. However, if the development of progressive difficulty in ventilating *via* mask occurred because of persistent and prolonged failed intubation attempts as previously described,[2] then prediction of DMV may be initially underestimated. Difficulties with mask ventilation and intubation cause swelling that makes ventilation and intubation more difficult with repeated attempts and may increase the incidence of the difficult ventilation–intubation scenario. Lastly, we failed to identify significant association between a given type of difficulty during mask ventilation and risk factors. However, because of the small number of patients with DMV, the power of such analysis was low, and thus further studies are needed to answer this question.

In conclusion, in a general adult population, DMV was reported in 5% of cases, and in case of DMV the risk of difficult intubation was increased fourfold. Five criteria (age older than 55 yr, BMI $>$ 26 kg/m$^2$, lack of teeth, presence of beard, history of snoring) were independent risk factors for DMV, and the presence of two of these criteria should at best indicate a DMV. The DMV prediction score is an indicator of a high risk of difficult airway and may lead to a better anticipation of difficult airway management, potentially decreasing the morbidity and mortality resulting from hypoxia or anoxia associated with a failed ventilation.

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## Appendix: Difficult Mask Ventilation (DMV) Data Form

The two parts (preoperative visit and induction of anesthesia) were provided on separate sheets and have been reassembled.

**DIFFICULT MASK VENTILATION (DMV) FORM**

**PREOPERATIVE VISIT** / month / day / year /

**PATIENT'S INITIALS :**

**AGE :** **SEX :** ❑ Male ❑ Female

**HEIGHT :** **WEIGHT :** **BODY MASS INDEX :**

**ANESTHESIOLOGIST :**

**1) MALLAMPATI Class:**
**( patient in sitting position, head in full extension, tongue out and with phonation)**

**Please encircle** 1 2 3 4

**2) Mouth opening : _____mm (interincisor distance)**

**3) Thyromental distance : _____ mm**
**(from thyroid cartilage to inside of mentum)**

**4) DMV risk factors :**

| | | |
|---|---|---|
| macroglossia : | ❑ YES | ❑ NO |
| receding mandible : | ❑ YES | ❑ NO |
| lack of teeth : | ❑ YES | ❑ NO |
| beard : | ❑ YES | ❑ NO |
| snorer : | ❑ YES | ❑ NO |

**5) Do you anticipate a DMV in your patient ?:** ❑ YES ❑ NO

**INDUCTION OF ANESTHESIA** / month / day / year /

**ANESTHESIOLOGIST :**

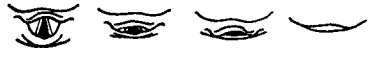
**Mask Ventilation ( 4 minutes, 10 l/min of oxygen flow)**

- ❑ easy
- ❑ difficult : ❑ $Sp_{O_2}$ < 92%
  - ❑ important gas flow leak by the face mask
  - ❑ ↗ gas flow above 15 l /min and $O_2$ flush valve > 2
  - ❑ no perceptible chest movement
  - ❑ 2 handed mask ventilation technique
  - ❑ change of operator required
- ❑ impossible

**Tracheal Intubation** ↗ ❑ easy
→ ❑ difficult
↘ ❑ impossible

**Cormack Grade ( Please encircle)**

1 2 3 4



**Paralyzing agents use :** ❑ YES ❑ NO

**Comments :**