# The Best Method to Predict Easy Intubation: A Quasi-Experimental Pilot Study

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**Purpose:** *To facilitate evaluation of the airway before endotracheal intubation, different scores have been developed, mainly to predict difficult airways. However, in anesthesia clinical practice in Sweden, scores would be more useful if they could also predict an easy airway, so that the correct category of anesthesia personnel can be allocated. Therefore, we evaluated whether scoring systems commonly used to predict difficult airways could also predict easy endotracheal intubation.*
**Design:** *This prospective observational study included patients who were scheduled for general anesthesia and required endotracheal intubation.*
**Methods:** *Airways were evaluated preoperatively by two independent variables, namely Mallampati classification and thyromental distance. After anesthesia induction, the Cormack and Lehane grade was assessed.*
**Finding:** *Mallampati scores yielded the highest specificity in predicting easy intubation, and Cormack and Lehane grades yielded the highest positive predictive value for predicting easy intubation.*
**Conclusions:** *Mallampati classification is an appropriate screening test for predicting easy intubation.*

**Keywords:** *intubation, Mallampati classification, Cormack and Lehane grade, airway management.*
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*Conflict of interest: None to report.*

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**IN THE PRACTICE OF ANESTHESIA**, airway management is of central importance to patient safety. Preoperative evaluations of patient airways have mainly focused on difficult intubation.[1-3] Airway classification scores, such as Mallampati classification, thyromental distance, and Cormack and Lehane grade, have been used separately or combined to improve predictions of difficult intubation.[4,5] Guidelines for the management of difficult airways have been issued by the American Society of Anesthesiologists (ASA) with the recommendation that "multiple airway features should be assessed."[6] However, few studies have focused on easy airways or easy intubation. This is an important point in Sweden because registered nurse anesthetists (RNAs), according to specified protocols and agreements, are allowed to induce general anesthesia in

patients who are independently scored as I or II by the ASA Physical Status Classification.[7] The RNAs are registered nurses who have a bachelor of science degree in nursing and a degree in advanced-level education in anesthesia, entitled "Graduate Diploma in Specialist Nursing—Anesthesia Care."[8]

Based on these conditions, we believe an airway classification that could predict easy intubation with very high specificity and adequate sensitivity would be a valuable clinical tool to ensure patient safety and to allow RNAs in Sweden to work with more independence. Therefore, the aim of the present study was to investigate whether Mallampati classification, thyromental distance, or Cormack and Lehane grade are effective tools to predict easy intubation.

## Methods

### *Design*

This prospective observational study included airway assessments in 87 patients scheduled for elective day surgery at a county hospital, conducted in September 2006. County hospitals in Sweden cover both outpatient and inpatient services; usually, there is one hospital for each county. In this study, day surgery refers to same-day surgery that does not require an overnight or hospital stay. Airway assessment was performed by the RNA responsible for the patient's anesthesia care and was documented in a standardized evaluation protocol. Ethical reviews concerning research conducted in the context of higher education were not needed before the year 2008. The study was approved by the local human ethics committee at the University of Gävle with no objections. No changes in the patient's anesthesia care were made; these assessments were and continue to be routinely conducted as part of the usual anesthesia care. However, all patients were informed about these assessments and the accompanying documentation. Written consent was obtained from the involved nurse anesthetist involved in the care. Inclusion criteria were patients with ASA physical status scores of I or II who were older than 17 years and were scheduled for general anesthesia requiring endotracheal intubation. Exclusion criteria were anesthesia with rapid sequence induction, pregnancy, and body mass index higher than 35 $kg/m^2$.

### *Airway Classifications*

Three different airway tests were used to categorize easy intubations, namely Mallampati classification, thyromental distance, and Cormack and Lehane grade. Preoperatively, Mallampati classification was assessed, with the patient in sitting position, as Class I (soft palate, fauces, uvula, and pillars were visible), Class II (soft palate, fauces, and uvula were visible), Class III (soft palate and base of uvula were visible), and Class IV (soft palate was not visible).[9] Thyromental distance, the distance from the tip of the thyroid cartilage to the tip of the mandible, was measured preoperatively with a 25-cm ruler with the patient in sitting position and with the neck fully extended.[10] After induction, Cormack and Lehane grade was assessed as Grade I (full view of the glottis), Grade II (glottis partly exposed, anterior commissure not visible), Grade III (only epiglottis was visible), and Grade IV (only the soft palate was visible) with the head in "sniffing" position.[11]

To assess intubation conditions, we documented the numbers of intubation attempts made according to ASA recommendations.[6] We also used a four-grade scale, namely quite easy, easy, somewhat difficult, or difficult intubation. In addition, the patient's gender, age, weight, and height were documented.

### *Management of Anesthesia*

Anesthesia was induced according to the local standard induction protocol and included 2.5 mg/kg propofol, 2 mcg/kg fentanyl, and 0.5 mg/kg atracurium, which was administered after first verifying that mask ventilation was adequate. After optimal muscle relaxation was obtained (approximately 3-5 minutes after injection), as measured by neuromuscular monitoring, the trachea was intubated with an endotracheal tube (size 7 mm for women and 8 mm for men; Mallinckrodt, Covidien, Sweden), using a Macintosh laryngoscope with blade numbers 3 or 4. Correct intubation was assessed by measuring $CO_2$ levels in the exhaled gas, as well as by auscultation of the chest and abdomen. Anesthesia was subsequently maintained with oxygen in nitrous oxide and isoflurane.

### *Data Collection*

All patient data were entered into a structured protocol by the nurse anesthetists who performed the

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