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Changes in difficult airway predictors following mandibular setback surgery

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Abstract. The aim of this study was to determine the effect of surgical mandibular backward movements on the predictors of a difficult airway. Thirty-seven skeletal class III patients were included in this study. The Mallampati score, body mass index (BMI), maximal inter-incisal distance, and thyromental and sternomental distances of these patients were evaluated preoperatively and at 6 months and 2 years postoperatively. A sagittal split ramus osteotomy (SSRO) without genioplasty was performed in all patients by the same surgical team, and anaesthesia was provided by the same anaesthesiologist using nasotracheal intubation. The paired samples *t*-test and Wilcoxon signed-rank test were used for statistical comparisons of the data. There were no statistically significant changes in BMI or sternomental and thyromental distances after SSRO. The maximal inter-incisal distance was significantly reduced at 6 months postoperatively ($P < 0.05$), but no statistical difference was found between the values obtained preoperatively and at 2 years postoperative. A statistically significant increase in Mallampati score was observed postoperatively ($P < 0.05$). Both the patient and practitioner should be aware of the risks associated with an increased postoperative Mallampati score in mandibular setback patients. The amount of mandibular setback in skeletal class III patients with a high preoperative Mallampati score should be limited to prevent potential postoperative airway problems.

Keywords: Mallampati score; difficult airway predictors; orthognathic surgery; sagittal split ramus osteotomy.

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Introduction

The Mallampati score is one of the most frequently used clinical pre-anaesthetic airway evaluation tests for the assessment of the difficulty of endotracheal intubation and is simple, reproducible, and reliable. The score is determined by the anatomy of the oral cavity; specifically, it is based on the visibility of the base of the uvula, plica glossoepiglottica lateralis, plica glossoepiglottica mediana, and soft palate.

As well as being used to evaluate the airway, the Mallampati score is also used to evaluate obstructive sleep apnoea (OSA) because both conditions are affected by similar craniofacial structures. The relationship between these conditions has been found to be stronger than those of other factors affecting the difficulty of intubation, such as body mass index (BMI), age, and gender, and is strongly associated with certain skeletal dimensions and mandible angles. There are several reports regarding the relationship between mandibular skeletal movement and OSA[1–3]; however, knowledge regarding mandibular movement and its impact on the Mallampati score is limited.

Mallampati et al. reported that the persistence of sleep-disordered breathing in children after adenotonsillectomy was significantly related to mandibular retrognathia and higher Mallampati scores.[4] Although it is known that there is a significant relationship between high Mallampati scores and mandibular retrognathia, the effect of isolated surgical mandibular movement (backward/forward) on the Mallampati score is unknown. Enacar et al. reported a significant decrease in hypopharyngeal airway space following mandibular setback surgery.[5] The hypopharyngeal airway space has also been reported to be affected by surgical rotation of the mandible.[6]

In addition to the Mallampati score, various other pre-anaesthetic evaluation methods are used to assess the difficulty of intubation. Body mass index (BMI), thyromental and sternomental distances, and the maximal inter-incisal distance are other predictors of a difficult airway. Changes in these predictors caused by surgical mandibular movement are also unknown. This prospective study was performed to determine the effect of surgical mandibular backward movement on the predictors of a difficult airway.

Materials and methods

Thirty-seven consecutive skeletal class III patients (22 female and 15 male; mean age 24.5 ± 6.3 years) were included in this prospective study.

Exclusion criteria were as follows: having undergone previous hard and/or soft tissue surgery in the head and neck region, craniofacial syndrome, obesity, and cleft lip/palate.

Surgical procedures

All surgical operations were performed by the same team between January 2012 and January 2013. A sagittal split ramus osteotomy (SSRO) without genioplasty was performed in all patients and the nasotracheal route was used for intubation for maintenance of anaesthesia.

None of the patients included underwent maxillary surgery. Internal rigid fixation was performed with a 2.0-mm miniplate and miniscrews system (DePuy Synthes, Zuchwil, Switzerland) and the patients had no intermaxillary fixation after orthognathic surgery.

Measurement techniques

The Mallampati score, BMI, maximal inter-incisal distance, and thyromental and sternomental distances of all the patients were measured preoperatively (T_0) and at 6 months (T_1) and 2 years (T_2) postoperatively. Mallampati scores, inter-incisal distances, and thyromental and sternomental distances were evaluated twice by a surgeon and an anaesthesiologist to eliminate bias in measurements.

The Mallampati score was determined with the head in neutral position, maximal mouth opening, and the tongue fully extended without phonation, using a modified Mallampati classification system to include hard palate visibility (Samsoon and Young's modified Mallampati classification[7]), as follows: (1) class I: visibility of the soft palate, fauces, uvula, and pillars; (2) class II: visibility of the soft palate, fauces, and base of the uvula; (3) class III: visibility of the soft palate; (4) class IV: visibility of the hard palate only (Fig. 1).

Thyromental and sternomental distances were evaluated in the supine position with the mouth closed. The thyromental distance was measured from the thyroid notch to the tip of the jaw. The sternomental distance was measured from the sternal notch to the tip of the jaw with the head extended.[8] The maximal inter-incisal distance was evaluated with a sensitive caliper without any instruction.

Statistical analysis

The statistical analysis was performed using SPSS version 18 software (SPSS Inc., Chicago, IL, USA).

Pre- and postoperative mean and standard deviation BMI, Mallampati score, thyromental and sternomental distance, and maximal inter-incisal distance values were compared using the Wilcoxon signed-rank test and paired samples *t*-test (with the level of significance set at $P < 0.05$).

Results

The mean mandibular setback of the 37 skeletal class III patients was 6.24 ± 1.7 mm.

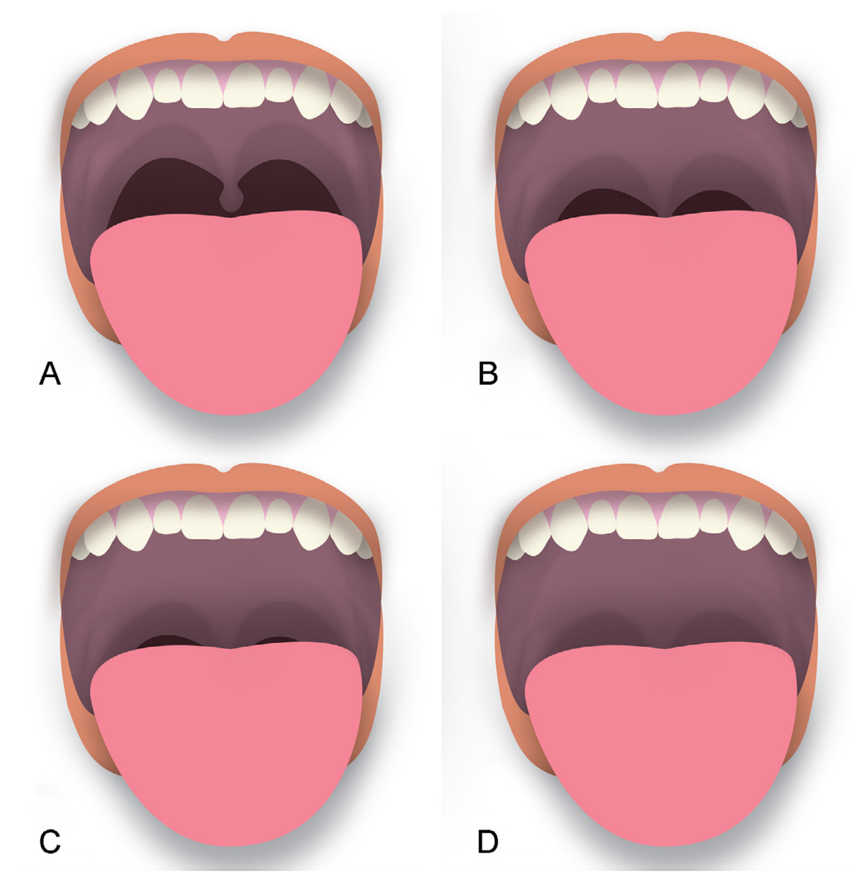

Fig. 1. Schematic diagram of the Mallampati classification. (A) Class I: visibility of all of the soft palate, fauces, uvula, and pillars. (B) Class II: visibility of the soft palate, fauces, and only the base of the uvula. (C) Class III: visibility of the soft palate. (D) Class IV: visibility of the hard palate only.