Left-molar Approach Improves the Laryngeal View in Patients with Difficult Laryngoscopy

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Background: The molar approach of laryngoscopy is reported to improve glottic view in sporadic cases of difficult laryngoscopy. The authors studied the effect of molar approaches and optimal external laryngeal manipulation (OELM) using the Macintosh blade.

Methods: A series of 1,015 adult patients who underwent general anesthesia and tracheal intubation was studied. Laryngoscopy was carried out using a Macintosh no. 3 or 4 standard blade. Three consecutive trials of direct laryngoscopy using the midline and left- and right-molar approaches were carried out under full muscle relaxation with optimal head and neck positioning. The best glottic views were recorded for each approach with and without OELM.

Results: Difficult laryngoscopy with a midline approach accounted for 6.5% (66 cases) before OELM and 1.97% (20 cases) after OELM. A left-molar approach with OELM further reduced difficult laryngoscopy to seven cases (P < 0.001 vs. midline approach with OELM); a right-molar approach with OELM reduced difficult laryngoscopy to 18 cases (P = 0.48).

Conclusions: The left-molar approach with OELM improves the laryngeal view in patients with difficult laryngoscopy. (Key words: Difficult intubation; glottic view; Macintosh blade; optimal external laryngeal manipulation.)

Difficult laryngoscopy is frequently overcome using a molar approach for laryngoscopy combined with optimal external laryngeal manipulation (OELM). To date, a right-molar approach has been recommended if using a straight-bladed laryngoscope,1–3 although we frequently have found that a left-molar approach is more effective in improving the direct glottic view if using a Macintosh blade. We therefore prospectively studied the efficacy of a molar approach and OELM to improve the direct laryngeal view when using the Macintosh blade.

Materials and Methods

Study Design

We included consecutive adult, nonpregnant patients with American Society of Anesthesiologists physical status classification 1, 2, or 3 requiring general anesthesia and tracheal intubation for elective surgery. Because repeated laryngoscopies could increase intracranial and arterial blood pressure through sympathetic stimulation, we excluded patients with poor physical condition such as those with severe ischemic heart disease, increased intracranial pressure, or respiratory distress. We also excluded patients who had loose molar teeth. The study protocol was approved by the institutional ethics committee for clinical studies and a written informed consent for each patient was obtained. Fifteen staff anesthesiologists participated in the study all of whom had extensive anesthesia experience at least for 5 yr.

Anesthesia was induced with intravenous thiopental and vecuronium bromide (0.20 mg/kg) after breathing pure oxygen for 3 min. Three direct laryngoscopies were carried out consecutively under full muscle relaxation with optimal head and neck positioning for intubation.4 We used a Macintosh no. 3 or 4 standard curved blade. OELM1 was applied by the laryngoscopist’s right hand.

First, the blade was inserted to the right of the tongue as a conventional technique (midline approach). The tongue is displaced to the left when the blade is advanced to its final position in the midline to provide the best glottic view. OELM was then applied and the best glottic views before and after the application of OELM were recorded. Second, the blade was drawn out of the mouth and immediately reinserted from the left corner of the mouth at a point above the left molars (left-molar approach; fig. 1).
The tip of the blade is directed posteromedially along the groove between the tongue and the tonsil until the epiglottis and glottis come into sight. Before elevating the epiglottis, the tip of the blade is kept in the midline of the vallecula and the blade is kept above the left molars. The view provided is framed by the flange, the lingual surface of the blade, and the tongue bulged to right of the blade. Again, the best glottic views before and after the application of OELM were recorded. Finally, the blade was inserted from the right corner of the mouth at a point above the right molars (right-molar approach). An assistant retracted the right corner of the mouth using his or her finger to make room to see the glottis. The best glottic views were recorded as with the left-molar approach. Oxygen saturation of arterial blood was monitored with pulse oximeter during the laryngoscopy. Rotation of the head was avoided throughout the study.

The laryngeal view with direct laryngoscopy was classified according to Cormack and Lehane as follows: grade 1, full view of glottis; grade 2, only posterior commissure visible; grade 3, only epiglottis visible; grade 4, no glottic structure visible. Difficult laryngoscopy was defined as grade 3 or grade 4 with application of OELM in each laryngoscopic approach. We used a simple data form to record the laryngeal views under different laryngoscopic approach (fig. 2).

Statistical Analysis
All data are expressed as median (range). The effect of each laryngoscopic approach on the grade of laryngeal view in the same individual was compared using Friedman’s repeated-measures analysis of variance on ranks. Multiple comparisons were carried out with Tukey’s test. Frequencies of difficult laryngoscopy in the same individuals were compared using McNemar’s test. Differences between groups were considered significant at $P < 0.05$. Statistical analysis was carried out using SigmaStat version 2.0 for Windows (Jandel Corporation, San Rafael, CA).

Results
We studied 1,015 patients, 481 male and 534 female, with a median age of 54 yr (range, 16–91 yr). Their median weight was 56.8 (29.0–119.0) kg, and their median height was 159.0 cm (range, 129.0–191.0 cm). Difficult laryngoscopy with the midline approach was encountered in 66 cases (6.5%); OELM reduced this to 20 cases (1.97%; $P < 0.001$). OELM also significantly reduced difficult laryngoscopy in the left- and right-molar approaches ($P < 0.001$). The patients classified as providing grade 1 or grade 2 views by the midline approach with OELM ($n = 995$) were intubated using midline approach and so were excluded from subsequent analysis.

The left-molar approach with OELM significantly improved the grade of laryngeal view ($P < 0.05$ vs. midline approach with OELM and right-molar approach with OELM); the right-molar approach with OELM did not show a significant improvement (fig. 3). The left-molar approach with OELM reduced difficult laryngoscopy from 20 to 7 cases ($P < 0.001$ vs. midline approach with OELM); the right-molar approach with OELM resulted in 18 difficult laryngoscopies ($P = 0.48$ vs. midline approach with OELM).

The left-molar approach with OELM improved laryngeal view from grade 3 or grade 4 to grade 1 or grade 2 in 13 cases. Tracheal intubation in these 13 cases was carried out under the direct visualization of the larynx by the left-molar approach with OELM. The endotracheal tube was, however, passed along the midline because the limited space for direct visualization of the larynx precluded passage of the tube over the molars with maintenance of a view of the larynx. OELM was applied by an assistant during intubation. The airways of the remaining seven difficult laryngoscopic cases were secured with the aid of fiberoptic intubation ($n = 3$), laryngeal mask airway ($n = 2$), blind intubation ($n = 1$), and McCoy laryngoscope ($n = 1$).
Values for oxygen saturation of arterial blood were 99% or higher in all patients during the study. The time required for consecutive laryngoscopies was no longer than 30 s. There was no evidence of bradycardia or tachycardia during laryngoscopy. Postoperatively, we noted no evidence of complications that were attributable to the laryngoscopy.

**Discussion**

The glottic view in patients with difficult laryngoscopy improved if the Macintosh blade was inserted at a point above the left molars. The Macintosh blade is widely accepted because it enables quick, atraumatic laryngoscopy^3^ and lower deviation of line of view from the ideal line than the Miller blade.⁶ Even using the Macintosh blade and an optimal sniffing position, however, a direct line of view to the glottis could be prevented, resulting in difficult laryngoscopy. The cause of difficult laryngoscopy is multifactorial, but obvious obstacles include maxillary structures such as prominent incisors and an increased volume of the tongue remaining anterior to the blade. The molar approach reduces the distance from the patient’s teeth to larynx and prevents intrusion of maxillary structures into the line of view. In addition, the molar approach avoids a large volume of the tongue remaining anterior to the blade, unlike the midline approach.

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**Data Form for the Study of Molar Approach**

| Date of Anesthesia | / / |
|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--||
Contrary to our result, a right-molar approach for direct laryngoscopy has been recommended for patients with difficult airways. In these reports, straight laryngoscopic blades were inserted from the right corner of the mouth at a point above the right molars. The only exception is a report by Akdikmen, who recommends introduction of an infant-sized straight blade from the left corner of the mouth at a point posterior to the molar teeth for adult patients with difficult laryngoscopy. The right-molar approach has the advantage that the bulging of tongue over the blade is prevented; the laryngeal view is framed by the laryngoscope and the right side of the patient’s mouth. A hockey stick-shaped stylet or assistant’s finger is necessary to pull the right corner of the mouth laterally in the right-molar approach. Because this maneuver is essential to make room to manipulate the endotracheal tube, the laryngoscopist cannot bring the blade fully to the right side of the mouth. The left-molar approach is, on the other hand, able to utilize the maximum effect of molar approach because the laryngoscopist can bring the blade fully to the left side of the mouth. The only drawback of the left-molar approach is the bulging of the tongue over the blade, which may obscure the view of the glottis. In practice, bulging of the tongue did not disturb the direct visualization of the glottis. The line of view of the laryngoscopist inevitably deviates laterally from the midline in molar approaches. This deviation makes it difficult to align the tip of endotracheal tube with the aperture of the glottis. To increase the efficacy of the left-molar approach, anesthesiologists should practice by using the technique on patients with normal airways.

Optimal external laryngeal manipulation is reported to reduce the incidence of difficult laryngoscopy if using a Macintosh blade from 9.3 to 5.9%, 8.8 to 3%, or 11.4 to 0.0%. We confirmed that OELM effectively reduced the incidence of difficult laryngoscopy (laryngeal view of grade 3 or grade 4) from 6.5 to 1.97% with midline approach using Macintosh blade. The present study also revealed that OELM significantly improved laryngeal views with left- and right-molar approaches. OELM should be routinely applied to both midline and molar approaches especially for patients with difficult laryngoscopy.

Despite the popularity of predictive tests of difficult laryngoscopy such as the Mallampati score, Wilson risk-sum score, and prediction with indirect laryngoscopy, they have been associated with unavoidable false positives and false negatives. If anesthesiologists encounter an unexpected difficult laryngoscopy, the left-molar approach with OELM provides an easy and reliable option.

In conclusion, we observed that the left-molar approach using a standard Macintosh blade improved the laryngoscopic view in patients with difficult midline laryngoscopy. The left-molar approach should be part of the anesthesiologist’s armamentarium in cases of difficult laryngoscopy.

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References