Comparative Study Of Molar Approaches Of Laryngoscopy Using Macintosh Versus Flexitip Blade

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Citation

Abstract
The molar approach of laryngoscopy with the Macintosh blade, compared to the Flexitip blade, was reported to improve glottic view. The authors studied the right molar, midline and left molar approach. They compared the Macintosh blade with optimal external laryngeal manipulation (OELM) versus the Flexitip blade with lever activation and also pressure responses and complications in various approaches and blades were studied.

Method:
A series of 180 adult patients who underwent general anaesthesia and tracheal intubation was studied. Laryngoscopy was carried out using a Macintosh no.3 (45 patients) or 4 (45 patients) or Flexitip no. 3 (45 patients) or No. 4 (45 patients). Three consecutive trials of direct laryngoscopy using the middle, left molar and right molar approach were carried out under full muscle relaxation. The best glottic view was recorded for each approach with and without OELM in case of Macintosh or with and without lever activation in case of the Flexitip blade.

Results:
Before OELM / lever activation the left molar approach had the maximum number of patients with Cormack Lehane- grade-I view with all type of blades. The left molar approach using the Macintosh no. 3 blade with OELM improves laryngoscopic view significantly.

Conclusion:
Pressure response was found to be associated with the duration of the laryngoscopy. The left molar approach using the Macintosh no. 3 blade with OELM improves laryngoscopic view significantly. OELM with Macintosh blade was found superior to the lever activation of the Flexitip blade.

INTRODUCTION
In cases of difficult laryngoscopy right molar approach with straight blade using OELM is frequently advised.1,2,3,4

But we frequently found it a little difficult to perform a right molar approach with the laryoscope in the left hand. Also, the Flexitip is frequently recommended in cases of difficult laryngoscopy. We therefore prospectively studied the efficacy of molar approaches,

efficacy of Macintosh blade with OELM, and the Flexitip with lever activation, to improve the direct laryngeal view. Also, we studied pressure response, complication rate in regard to approach and blade used. The study is an attempt to find an alternative method or use of appropriate blade for better glottic visualization.
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Figure 1
Figure 1: Right molar approach before OELM

Figure 2
Figure 2: Right molar approach after OELM

Figure 3
Figure 3: Left molar approach before OELM

Figure 4
Figure 4: Left molar approach after OELM
MATERIAL AND METHODS
STUDY DESIGN

We included 180 consecutive, adult, non-pregnant patients with American Society of Anaesthesiologist physical status classification- I and with Mallampati; classification I to IV requiring general anaesthesia and tracheal intubation for electives surgery. Because repeated laryngoscopies could increase intracranial and arterial blood pressure through sympathetic stimulation, we excluded patients with poor physical condition, hypertension, Ischemic heart disease, raised intracranial tension and respiratory distress. Also patients with loose molar teeth, intra-oral tumors, neck swelling and patients below 18 yrs and above 70 yrs were excluded from the study. The study protocol was approved by the institutional ethics committee for clinical studies and a written informed consent for each patient was obtained. All anaesthesiologists, participated in the study, have experience of at least 2 years in anaesthesia.
Anaesthesia was induced with intravenous thiopentone sodium 5 mg/kg or propofol 2 mg/kg and Inj. Vecuronium or pancuronium (0.1 mg/kg) IV. after preoxygenation with 100% oxygen for 3 minutes. Three direct laryngoscopies by the right molar, midline and left molar approach were carried out consecutively under full muscle relaxation with the optimal head and neck positioning for intubation. The Cormack and Lehane grades of glottic visualization were noted in all three approaches before as well as after optimal external laryngeal manipulation or lever activation. Out of 180 patients, 90 patients were studied using the Macintosh blade (Group A) and 90 patients were studied using the Flexitip blade (Group B). We used the Macintosh no. 3 curved blade to study 45 patients (Group A1). Intubation in 15 patients each were carried out by the right molar, midline and left molar approach.

The remaining 45 patients in group A were studied by using the Macintosh No. 4 curved blade (Group – A2).

In Group B, 45 patients were studied using the Flexitip No. 3 blade (Group B1) and remaining 45 patients using the Flexitip No. 4 blade (Group – B2).

In case of the Flexitip group, all three right molar, midline and left molar approaches were performed and the Cormack Lehane grades of glottic visualisation noted both before lever activation and after lever activation of the Flexitip blade.

While performing the molar approach, 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 valecula and the blade is kept above the molars. Midline approach was performed by conventional method of laryngoscopy. If time required for individual approach was more than 10 seconds patient was ventilated with 100% oxygen for 5 seconds and next approach was carried out. Approach by which intubation was to be carried out was performed at the last. During procedure, patient was monitored using cardioscope, pulseoximeter (to maintain SPO2 > 95%), manual Blood pressure monitoring.

During each approach, pressure response i.e. change in pulse rate, Blood pressure to laryngoscopy, time taken for approach, number of intubation attempts by particular approach and related complications were noted.

The laryngeal view of glottic visualization with direct laryngoscopy was classified according to Cormack and Lehane 6 as follows: Grade – I, full view of glottis; grade – II, only posterior commissure visible; grade – III, only epiglottis visible and in grade – IV, no glottic structure visible.

**STATISTICAL ANALYSIS**

All data are expressed as mean (SD). Demographic parameters and airway parameters compared by ANOVA application and Pearson chi. Square test. The effect of each laryngoscopic approach on the grade of laryngeal view before and after OELM/ Flexitip lever activation was compared using Pearson's chi. square test. Approach related hemodynamic changes were compared by ANOVA application, while complications were compared using Pearson's chi. Square test.

Differences between groups were considered significant at P < 0.05.

**RESULTS**

We studied 180 patients, 117 male (65%) and 63 female with American society of Anaesthesiologist grade I with median age of 34.0 13.07 yrs. for the Macintosh group (Group – A) and 30.52 10.81 yrs. for the Flexitip group (Group B). Their median weight was 55.64 7.77 kgs. for group A and 53.21 8.82 kgs for group B. The mean hyomental distance was 6.74 0.37 cms for group – A and 6.60 0.61 cms for group – B while mean thyromental distance was 7.57 0.44 cms for group – A and 7.68 0.86 cms for group– B. Out of 180 patients, 136 patients had Mallampati grade – I and 44 patients had Mallampati classification grade – II (MPC – II) while no one was with grade – III or IV.

Before OELM / Lever activation left molar approach had maximum number of patients with Cormack Lehane grade – I view in all type of blades followed by midline approach and right molar approach.

After OELM in the Macintosh-3 (A1) group left molar and midline approach had 45 patients (100%) each with Cormack Lehane grade – I view and right molar approach had 42 patients (93.30%) with Cormack Lehane grade – I view.

While in remaining blades i.e. the Macintosh – 4, Flexitip – 3 and 4, after OELM / lever activation, left molar approach had maximum number of patients with Cormack Lehane grade-I view followed by midline approach and right molar
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In the Macintosh – 3 group, OELM significantly improved view of glottic visualisation (p value for right molar – 2.41 E – 10, midline approach – 3.04 E – 08, left molar approach – 0.002).

In other groups, also OELM / lever activation improved grade of glottic visualisation but OELM with the Macintosh blade was found to be superior to lever activation of the Flexitip. As in left molar approach in the Macintosh no. 3 and 4 blade, 45 patients (100%) each had Cormack Lehane grade – I view after OELM while 42 (93.30%) patients and 38 (84.40%) patients had Cormack Lehane grade – I view with the Flexitip No. 3 and 4 respectively after lever activation (p – 0.003).

Before OELM / lever activation there was no significant differences in view of glottic visualisation in different blade groups.

After OELM / lever activation the Macintosh – 3, followed by Macintosh – 4 followed by the Flexitip – 3 and Flexitip – 4 had Cormack Lehane grade – I view in all approaches ( p value right molar – 0.017, midline – 0.020 and left molar – 0.003).

Time required for laryngoscopy was minimum for midline approach (9.69 sec) followed by left molar approach (11.0 sec) and right molar approach (11.87 sec) while it was maximum for the Flexitip – 3 and 4 blades.

Left molar approach required more number of second intubation attempts i.e. 9 patients (14.99%) as compared to midline and right molar approach i.e. 4 patients (6.66%) each ( p value not significant) while no blade was superior over other regarding number of attempts for intubation.

Pressure response was found more after laryngoscopy by right molar approach, which required more time for laryngoscopy, in all blade groups.

Rise in pulse rate was found more after using the Flexitip – 4 blade and was minimum with the Macintosh – 4 (p – 0.000) while there was no significant difference in systolic and diastolic Blood pressure changes.

The rate of complication was more after the laryngoscopy by right molar approach and was minimum after midline approach while the Flexitip – 4 had more complication rate while the Macintosh – 3 was with minimum complication rate although statistically not significant.

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**Figure 7**

Table 1: Demography of the study cases

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Parameter</th>
<th>A1</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>P value</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>No. of Patients</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>NS</td>
</tr>
<tr>
<td>2</td>
<td>Age (years)</td>
<td>Mean</td>
<td>33.42</td>
<td>36.60</td>
<td>29.47</td>
<td>32.68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>13.23</td>
<td>13.02</td>
<td>10.17</td>
<td>11.15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>18-60</td>
<td>18-65</td>
<td>18-62</td>
<td>18-65</td>
</tr>
<tr>
<td>3</td>
<td>Weight (kgs)</td>
<td>Mean</td>
<td>56.13</td>
<td>55.16</td>
<td>61.69</td>
<td>54.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>6.97</td>
<td>8.56</td>
<td>6.73</td>
<td>10.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>30-66</td>
<td>30-65</td>
<td>39-67</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4</td>
<td>Sex (M / F)</td>
<td>35/10</td>
<td>31/14</td>
<td>23/22</td>
<td>28/17</td>
<td>NS</td>
</tr>
<tr>
<td>5</td>
<td>Hyrachal distance (cms)</td>
<td>Mean</td>
<td>6.69</td>
<td>6.81</td>
<td>5.52</td>
<td>6.68</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>0.32</td>
<td>0.49</td>
<td>0.60</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>6-7</td>
<td>6-8</td>
<td>5-5</td>
<td>5-8</td>
</tr>
<tr>
<td>6</td>
<td>Thyrochelal distance (cms)</td>
<td>Mean</td>
<td>7.50</td>
<td>7.64</td>
<td>7.69</td>
<td>7.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>0.43</td>
<td>0.45</td>
<td>0.84</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>7-8</td>
<td>6-9.5</td>
<td>6-10</td>
<td>6-9.5</td>
</tr>
<tr>
<td>7</td>
<td>M/C grade (I / II / III / IV)</td>
<td>34/11/00</td>
<td>39/7/00</td>
<td>30/15/00</td>
<td>34/11/00</td>
<td>NS</td>
</tr>
</tbody>
</table>

( NS-not statistically significant)

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**Figure 8**

Table 2: Cistribution of Cormack Lehane grades in different approaches in group-A1.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Approach</th>
<th>Time</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right molar</td>
<td>Before OELM</td>
<td>11(24.40%)</td>
<td>29(62.30%)</td>
<td>9(12.30%)</td>
<td>0(0%)</td>
<td>[14]E-10</td>
</tr>
<tr>
<td></td>
<td>After OELM</td>
<td>42(93.30%)</td>
<td>3(6.70%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Midline</td>
<td>Before OELM</td>
<td>20(44.40%)</td>
<td>22(48.90%)</td>
<td>2(4.30%)</td>
<td>0(0%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>After OELM</td>
<td>45(100%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Left molar</td>
<td>Before OELM</td>
<td>36(80%)</td>
<td>9(20%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0.002*</td>
</tr>
<tr>
<td></td>
<td>After OELM</td>
<td>45(100%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td></td>
</tr>
</tbody>
</table>

* P value is significant.

After OELM midline and left molar approach were equally effective.
Figure 9
Table 3: Distribution of Cormack Lehane grades in different approaches in group-B1.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Approach</th>
<th>Time</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right molar</td>
<td>Before lever</td>
<td>11(34.40%)</td>
<td>25(85.60%)</td>
<td>4(17.80%)</td>
<td>2(2.20%)</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After lever</td>
<td>33(77.18%)</td>
<td>17(38.60%)</td>
<td>2(2.20%)</td>
<td>3(0.0%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Macintosh</td>
<td>Before lever</td>
<td>22(44.40%)</td>
<td>27(54.00%)</td>
<td>6(12.00%)</td>
<td>0(0.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>After lever</td>
<td>43(93.80%)</td>
<td>5(10.90%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Left molar</td>
<td>Before lever</td>
<td>26(57.80%)</td>
<td>15(33.90%)</td>
<td>4(8.90%)</td>
<td>0(0.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>After lever</td>
<td>42(93.00%)</td>
<td>5(10.70%)</td>
<td>0(0.0%)</td>
<td>0(0.0%)</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

The glottic view in patients improved if the Macintosh blade was inserted at a point above the left molars.

APPROACH

In our study both before as well as after Optimal External Laryngeal Manipulation (OELM) / Lever activation, left molar approach had maximum number of patients with Cormack Lehane grade – I view, while right molar approach performed poorly.

It was found that OELM after the Macintosh Laryngoscopy significantly improved grade of glottic visualization. Ken Yamamoto et al in their study also found improvement in glottic view with OELM. We compared it to lever activation of the Flexitip blade as well. OELM was found superior to lever activation. The cause of difficult laryngoscopy is multifactorial, but obvious obstacles are maxillary structures such as prominent incisors and increased volume of tongue remaining anterior to the blade. Henderson JJ 4 also found paraglossal straight blade laryngoscopy helpful in difficult tracheal intubation cases.

The molar approach reduces the distance from the patients teeth to the larynx and prevents maxillary structures coming into the line of view and avoids a large volume of tongue remaining anterior to the blade.

Although statistically not significant, left molar approach required a maximum number of second intubation attempts, i.e. 9 patients (14.99%) while midline and right molar approach were equally good. The left molar approach is 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. Also the deviation of the line of view of the laryngoscopist makes it difficult to align tip of endotracheal tube with the aperture of the glottis. Ken Yamamoto et al found it difficult to align the tip of the endotracheal tube with the aperture of the glottis. To increase efficacy of the left molar approach, practice in normal patients is necessary. Time taken for laryngoscopy (11.87 sec) and pressure response to laryngoscopy was maximum after the right molar approach while time taken was minimum for midline approach.

Although statistically not significant, the rate of complication was maximum (23 patients) after the right molar approach and minimum after midline approach (13 patients).

BLADE

Before as well as after airway manipulation (OELM / lever activation), the Macintosh blade performed well and had maximum number of patients with Cormack Lehane grade – I view as compared to the Flexitip blade. The flexitip no. 4 performed very poorly while the Macintosh no. 3 was best after OELM.

Time taken for laryngoscopy was higher for the flexitip – 3 followed by the flexitip – 4 while it was minimum for the Macintosh no. 4.

Increase in pulse rate was more after the flexitip – 4 while minimum after using the Macintosh – 4.

There was not statistically significant change in systolic or
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diastolic blood pressure between the Macintosh or the Flexitip group. The Flexitip – 4 was associated with more number of second intubation attempts and the complication rate while the Macintosh – 3 was associated with minimum complications.

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

In conclusion we observed that left molar approach using the Macintosh no. 3 blade with OELM improves laryngoscopic view significantly. But intubation by the left molar approach was found slightly difficult due to bulge of tongue on blade which can be overcome by practicing or gum elastic bougie guided intubation is another option when visualization of glottis is possible but intubation is difficult by left molar approach. Pressure response was found to be associated with duration of laryngoscopy.

OELM after using the Macintosh blade was found superior to lever activation of the Flexitip blade for glottic visualisation.

Complications were found more frequently with the right molar approach, which was slightly more difficult to perform and after using the flexitip – 4 blade while minimal after midline approach and by the Macintosh – 3 blade.

References
Author Information

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