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# Can Paraglossal Approach be an Effective Alternative to the Conventional Laryngoscopy in Routine Anesthesia Practice- A Comparative Study

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## Abstract

**Background:** Paraglossal technique was described as early as 1930 but is seldom taught now or practiced.

**Objective:** To evaluate the effectiveness of paraglossal technique over conventional approach and to evaluate the ease of insertion and glottic view obtained.

**Type of the study:** Randomized Controlled Trial

**Material and methods:** After taking informed consent 140 patients scheduled for elective surgery under general anesthesia were enrolled for the study. They were randomally divided into Group P: Intubation was performed using paraglossal approach with Miller blade and Group C: Intubation was done using conventional larynogoscopy technique with Mcintosh blade. Comparisons were made in improvement in Cormack Lehane grade, intubation difficulty score, time taken for intubation and complications if any.

**Results:** Cormack Lehane Grade I was obtained in 97.1% ( 68) subjects in paraglossal group as compared to 67.1% ( 47) in group C (p=0.02). Time taken for intubation was significantly more in group C (p=0.014). The median (IQR) IDS value were 4 (4-5) and 5 (4-6) paraglossal and conventional laryngoscopy respectively. The Median (IQR) ease of intubation on Likert scale was graded as 1 (1-2) and 1 (1-1) for Group P and C respectively.

**Conclusion:** Paraglossal approach improves the glottic visualization and also leads to successful intubation. We recommend that paraglossal approach be taught to anesthesia residents as an alternative technique so that it can be used with confidence if conventional laryngoscopy fails.

**Keywords:** Paraglossal; Conventional laryngoscopy; Miller blade, Intubation difficulty scale (IDS)

## Introduction

Endotracheal intubation is the most widely practiced technique by anesthesiologists worldwide. The conventional technique using the Macintosh blade usually gives a good view of the glottis. It can lead to false confidence in the user arising from the belief that any problem when occurs is the fault of the patient or the user and not the technique [1]. Often the anesthesiologist faces a situation where tracheal intubation is difficult. There is battery of tests available to predict difficult intubation but none of the techniques is 100% reliable [2]. The use of fiberoptic intubation has changed the scenario of difficult intubation but its use is precluded by high cost and expertise required [3]. Presence of blood, secretions and mucus in emergency situations can make the fibreoptic technique difficult.

The revolutionary advent of video laryngoscopes has given a facelift to the process of endotracheal intubation but even this has several shortcomings namely fogging of the lens, variable learning curve, an acutely angled stylet is required, and it is more expensive than the traditional laryngoscope [4].

The primary aim of this study was to compare improvement in glottic visualization and ease of intubation using paraglossal approach with Miller blade and traditional approach using Mc Intosh blade. The secondary objective was to compare the hemodynamic variations using both the techniques.

## Material and Methods

After obtaining approval from Institutional Ethical Committee and written informed consent from the patients, this randomized controlled trial was conducted on 140 patients in age group of 20-45 years of either sex belonging to American Society of Anaesthesiologist (ASA) physical status grade I or II.

### Exclusion criteria

Patient who refused to give consent, patients with oro-pharyngeal and facial trauma, those who had potential difficult bag mask ventilation, hypertensive and diabetic patients, those requiring rapid sequence intubation, patients at risk of gastric aspiration, pregnant subjects, patients with unstable cervical spine or previous spine surgery and patients without incisors.

The patients were divided by computer generated randomization into two equal groups of 70 subjects in each group: Group P: Intubation was performed using paraglossal approach with Miller blade and Group **C**: Intubation was done using conventional larynogoscopy technique with Mc Intosh blade.

Selected cases underwent routine pre anaesthetic check up and laboratory investigations as per protocol. Pre-operative airway evaluation was done by an unbiased anaesthesiologist who was

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unaware of the patient's group allocation. This included the Mallampati assessment, thyromental distance, and neck flexion and extension. If the airway was judged to be difficult using the any of these three criteria, the patient was excluded from the study.

Eight hours of fasting was recommended and pre medication with tablet ranitidine 150 mg in night and tablet midazolam 7.5 mg one hour prior to surgery was prescribed to all the subjects.

Following an explanation of the study and informed consent, patients were escorted to the operating room where intravenous line was started and standard monitors were attached. The patient were preoxygenated with 100% oxygen for 3 minutes and induced with iv inj. propofol 1.5 to 2 mg/kg sufficient to lose verbal contact, i/v inj. fentanyl 1.5 µg/kg. Patients were assessed for ease of bag and mask ventilation and then were paralyzed with iv inj. vecuronium bromide 0.1 mg/kg and ventilated for 3 minutes with oxygen, nitrous oxide (40:60) and isoflurane (1%). Patient's head was placed on a 7 cm high cushion and manipulations to achieve maximum possible sniffing position were done. Cormack & Lehane grade with Macintosh laryngoscope was recorded in this position by one of the two laryngoscopists involved in the study using either a no 3 or a no 4 blade as deemed suitable by him. No external laryngeal manipulation or aid was taken to improve C&L grade. The view was assigned a class based on the modified Cormack Lehane (CL) grade 3 (Grade I-Vocal cords visible, Grade II a-Only posterior commissure visible, Grade II b–Only arytenoids visible, Grade III-Only epiglottis visible, Grade IV-No glottic structure visible).

A second laryngoscopist then performed endotracheal intubation. He was kept blind to the finding of the first laryngoscopist. The study group laryngoscope blade was kept ready by the side of the head of the patient. With the count of three, the laryngoscope was picked and introduced using the standard techniques.

### Intubation using paraglossal approach with Miller blade

Laryngoscope blade is inserted from the extreme corner of the mouth. An assistant retracts laterally on the cheek and the blade is inserted so that it passes immediately beside the tongue and then next to the tonsillar pillar on the right side of the oropharynx. Once the epiglottis is visualised it is gently lifted to expose the vocal cords. The laryngoscope blade remains lateral to the tongue at all times and no attempt is made to bring the blade base toward the midline. In this way the laryngoscope is in a paraglossal position and the endotracheal tube (ETT) is inserted in the lateral aspect of the mouth. The ETT is directed underneath the laryngoscope blade and its natural curvature brings it back up towards the vocal cords as it is advanced. No attempt is made to insert the ETT beside the blade as there is insufficient room to manoeuvre it successfully to the trachea.

Each attempt was timed using a stopwatch. The end point of each insertion was taken when there is bilateral chest movement, square wave on capnograph and $SpO_2$>95%. Any attempt requiring more than 120 seconds or 3 attempts was termed as failed attempt and alternative method for tracheal intubation was applied immediately and duly recorded. Endotracheal intubations was performed using size 7.0 or 7.5 mm ETT in females and 8.0 or 8.5 mm ETT in males by the anaesthesiologist who had undertaken at least 30 intubations with each technique in manikins and atleast 20 intubations in the clinical setting with each laryngoscope before the conduct of this study. All the participants had been performing this technique for over six months. In every alternate case the laryngoscopists switched roles with the instruments.

### Maintenance

The patient was maintained under general anesthesia by giving top ups of inj. vecuronium bromide (0.02 mg/Kg), mixture of 40% oxygen with 60% nitrous oxide and isoflurane (1%). At the end of the surgical procedure anaesthesia was discontinued and residual neuromuscular blockade was reversed with i/v inj. neostigmine (0.05 mg/Kg) and i/v inj. glycopyrrolate (10 µg/kg).

Data was collected by an independent unblinded observer.The following observations were made: Time taken for intubation was divided into two intervals and recorded as: T1-time taken from mouth opening to insertion of the study blade and T2-time taken from laryngoscopy to achievement of intubation. Intubation Difficulty Scale (IDS) [5]; Interpretation of IDS was done as (0=easy, 1-5 mild difficulty, >5 moderate –severe difficulty and ∞=impossible intubation); haemodynamic parameters during laryngoscopy .The laryngoscopist was asked to complete a five-point Likert-style survey to assess his or her overall ease of intubation with both techniques [6] 1=extremely easy, 2=easy, 3=somewhat easy, 4=not very easy, 5=most difficult.

Any complication occurring during intubation like fall in saturation $SpO_2$<95%, dental trauma, esophageal intubation, laryngospasm and mucosal trauma. Any post operative complication like sore throat and hoarseness of voice.

### Statistical analysis

We based our sample size estimation on IDS. Based on initial pilot study we proposed that IDS score 0-1 represents easy intubation in 60%subjects. We hypothesized that paraglossal approach reduces the score by 20% that is effect size is 40% .Level of significance (type I error) is 5% and the power of the study is 80%.Based on this the sample size was calculated to be approximately 66 patient per group. To be conventional 70 patients were enrolled in each group.

Data was analyzed using SPSS - 22. Continuous data are presented as Mean ± SD, ordinal data as median with Interquartile range (IQR). Categorical data were compared using chi square test. Independent 't' test was used to compare the groups. For all the analysis the significance level was taken as $p<0.05$

## Results

A total of 140 patients were included in the study. There were no exclusions after the recruitment. Demographics, including age, weight and Mallampati score were compared and were similar in both groups (Table 1). All the patients were easy to ventilate and there were no failed intubations. 85% of the subjects were intubated in the first attempt. In group C two subjects were intubated in third attempts, both the patients had CL grade IIIA.

The time taken for laryngoscopy and intubation TI and T2 respectively was significantly reduced in group P ($p<0.05$). Using paraglossal approach ease of insertion as assessed by Likert scale was 81.4% while with traditional approach was 70% (Table 2). The paraglossal approach significantly reduced the median IDS score (Table 3) and improved the Cormack Lehane glottic view

| | Group P | Group C |
|---|---|---|
| **Age (Mean ± SD)** | 40.38 ± 14.8 | 37.98 ± 14.2 |
| **Sex F:M** | 44:26 | 45:25 |
| **ASA Grade I:II** | 60:10 | 55:15 |
| **MP Grade I:II:III** | 38:28:04 | 40:25:5 |

**Table 1:** Demographic profile of patients included in the study.

| | Group P | Group C | p value |
|---|---|---|---|
| **CL Grade I/IIA/IIB/IIIa** | 39:17:9:5 | 39:21:7:3 | |
| Time for laryngoscopy sec (Mean ±SD) | 8.43 ± 1.9 | 12.03 ± 4.6 | 0.00* |
| Time for intubation (Mean ±SD) sec | 28 ± 1.46 | 29.74 ± 2.8 | 0.014* |
| Complications | 1(1.4%) | 9(12.8%) | |
| Likert Scale (1:2:3:4) | 57:7:3:3 | 49:7:6:8 | |

*p<0.05 significant difference

**Table 2:** Intubation details.

| Variables | Group P | Group C | p value |
|---|---|---|---|
| **No of attempts(N1)** | | | |
| 1 | 60 (85.7%) | 59 (84.3%) | p>0.05 |
| 2 | 10 (14.3%) | 9 (12.9%) | |
| 3 | 0 | 2 (2.9%) | |
| **No of operators (N2)** | | | |
| 1 | 68 (97.1%) | 67 (95.7%) | p>0.05 |
| 2 | 2 (2.9%) | 3 (4.3%) | |
| **No of alternative techniques (N3)** | | | |
| 1 | 68 (97.1%) | 66 (94.3%) | p>0.05 |
| 2 | 2 (2.9%) | 4 (5.7%) | |
| **Glottic exposure Cormack Lehane Grade** | | | |
| 1 | 68 (97.1%) | 43 (61.4%) | |
| 2A | 2 (2.9%) | 15 (21.4%) | |
| 2B | | 6 (8.6%) | |
| 3A | | 3 (4.2%) | |
| **Lifting force required during surgery (N5)** | | | |
| Normal | 63 (90%) | 53 (75.7%) | p>0.05 |
| Increased | 7 (10%) | 17 (24.3%) | |
| **Laryngeal pressure applied for optimizing glottis opening (N6)** | | | |
| No | 62(88.7%) | 42 (60%) | p>0.05 |
| Yes | 8(11.4%) | 28 (40%) | |
| **Position of vocal cords (N7)** | | | |
| Abducted | 70 (100%) | 70 (100%) | P<0.05 |

**Table 3:** Comparison of intubation difficulty scale between the two groups.

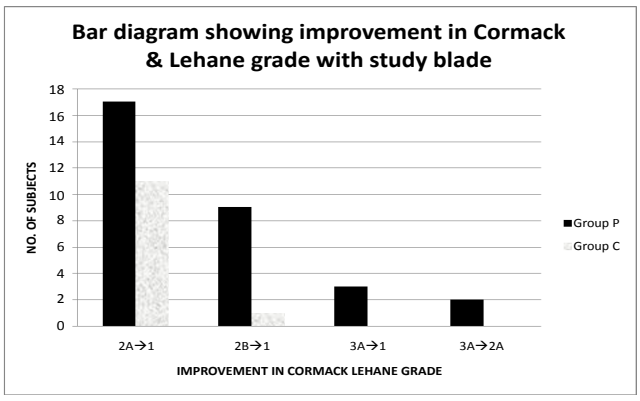


**Figure 1**: Bar diagram showing improvement in Cormack Lehane Grade with the study blade.

(Figure 1). Cormack Lehane Grade I was obtained in 97.1% ( 68) subjects in paraglossal group as compared to 67.1% ( 47) in group C. Fewer maneuvers were required with paraglossal approach to improve glottic exposure compared to conventional approach. Hemodynamic responses to laryngoscopy were within expected limits.

In group P only complication recorded was esophageal intubation in 1 subject while in group C 1 subject suffered mucosal trauma, one esophageal intubation while 7 patients complained of sore throat postoperatively. However, there were no serious complications observed during this study.

## Discussion

The Miller laryngoscope was introduced in 1941 for endotracheal intubation and the paraglossal approach was described by Magill in 1930, but at present this technique is rarely used or taught [7].

We observed that the laryngoscopy with the Miller blade using paraglossal approach improved Cormack Lehane grade more than the Macintosh blade with conventional approach and this observation is in accordance with those of other investigators. The difference in the glottic visualization using different blades has been explained by Racz GB [8]. With Macintosh blade the curvature of the blade acts as a visual hill interrupting the line of sight called the crest of the hill effect whereas with the volume of tissue required to be displaced to obtain the view is longer.

The use of paraglossal technique with straight blade improves visualization due to reduction of soft tissue compression (central component of line of sight). The straight blade overcomes the intrusion of curvature of Mc-Intosh blade into line of sight. Improved view by extension of head is possible with use of straight blade but not by curved blade [9]. Previous studies have reported that good laryngeal view with the intubating device does not equate with ease of intubation which is in contrast to our study as we used paraglossal approach [10,11].

As observed in previous studies we found the OLEM was more often needed with Mc Intosh blade as compared to Miller blade which improved glottic visualization [9,12].

Barkhordari et al. [13] compared post operative sore throat (PST) following laryngoscopy and intubation with curved or straight blade. They observed that the type and design of laryngoscope blade has no association with the incidence and severity of PST.

Today video laryngoscopes have taken the scenario by storm. Even though they are a lucrative option they are also marred with shortcomings like fogging of the lens, cost, long learning curve and availability [14]. The use of fibreoptic intubation is often precluded by high cost and expertise. Due to these reasons various authors have recommended proficiency in using alternative techniques of intubation using more than one type of laryngoscope and blades [15].

This approach can also be alternative to second laryngoscopy attempt instead of using conventional technique and blade in difficult airway algorithm.

The paraglossal approach does require diligence to master but is certainly worth the effort and the introduction of improvements in the Miller blade in recent years by Henderson facilitate the paraglossal approach because of the width and overall design of the blade. Whatever literature is available has given a positive conclusion and has always raised the same question as to why this technique is not routinely taught or included in the routine practice [1,15].

Limitation of the study it is impossible to blind the anesthesiologist to the type and design of the blade so there is bound to be some bias. The results may vary in hands of less experienced personnel. The patient included in the study belonged to ASA I, II with MP grade I, II so it is difficult to say what will be the response in patients with difficult airway. To rule out subjectivity of Cormack and Lehane grade and Likert scale, we have used IDS which is more objective and found

to have a good agreement between subjective indices of difficulty of intubation

## Conclusion

In this prospective study we observed that the glottic visualization and intubation was easier with Miller blade using paraglossal approach. We recommend that this technique be taught to new generation of anesthetist and practiced routinely.

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