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Evaluation of blind oral intubation as an alternative to conventional endotracheal intubation techniques

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Abstract:
Difficult airway management remains a major challenge during anesthesia, creating the need for effective alternatives to conventional laryngoscopy-guided endotracheal intubation. Therefore, it is of interest to evaluate the efficacy of blind oral intubation and conventional laryngoscopy-guided intubation in 100 patients undergoing elective surgery under general anesthesia. First-pass success rate, total intubation time, hemodynamic responses and procedure-related complications were compared to determine the effectiveness and safety of both techniques. Blind oral intubation achieved satisfactory success with comparable complication rates in selected patients, showing its potential utility when conventional laryngoscopy is difficult or unavailable. Thus, data support blind oral intubation as a practical alternative airway management technique, particularly in difficult airway scenarios and resource-limited healthcare settings.

Keywords: Blind oral intubation, endotracheal intubation, airway management, supraglottic airway devices, difficult airway

Background:
Endotracheal intubation is the gold standard for securing a patent airway and airway management is a basic skill in anesthesia, emergency medicine and critical care. The conventional endotracheal intubation is usually done by direct laryngoscopy, which provides a view of the vocal cords and helps to place the endotracheal tube in the trachea. Although this technique is widely used, it is very operator-dependent and can be difficult in patients with difficult airway anatomy, trauma, or limited mouth opening **[1]**. In the last ten years, alternative airway management techniques has been investigated to overcome these limitations. Blind oral intubation, which is the insertion of an endotracheal tube without direct visualization of the vocal cords, has been suggested as an alternative in certain clinical situations **[2]**. This technique is frequently done directly or via supraglottic airways like intubating laryngeal mask airway (ILMA) and i-gel. These devices can function as a conduit for blind intubation of the trachea and have been found to be effective in increasing the success rate and decreasing the complexity of the procedure **[3, 4].** In 2018, a randomized controlled trial was performed to compare the first-pass success rate and intubation time of blind intubation using LMA Blockbuster with i-gel devices, which showed that blind intubation using LMA Blockbuster, had a significantly high first-pass success rate and shorter intubation time. Likewise, reviews have indicated that supraglottic airway devices like the Fastrach LMA and Air-Q can be used to perform blind intubation with satisfactory success and safety rates **[5, 6]**. Blind techniques are especially beneficial in emergency situations, prehospital care and when visualization of the airway is limited by blood, secretions, or anatomical variations **[7]**. Under these circumstances, normal laryngoscopy can be unsuccessful or require repeated attempts, which can result in hypoxia and airway trauma. For example, blind nasal intubation has been extensively applied in spontaneously breathing patients and success rates from 58% to 72% have been reported in prehospital settings **[8, 9]**. However, blind intubation techniques have some drawbacks. There are some concerns, such as lower success rates than direct laryngoscopy, risk of esophageal intubation and reliance on operator experience **[10]**. Also, the development of airway devices, including video laryngoscopes, has enhanced visualization and increased the first pass success rate, which may have reduced the need for blind techniques in modern practice. However, blind intubation is still a useful technique in situations of equipment failure or in resource-poor environments **[11]**. Access to advanced airway devices might be restricted in India and other developing countries, particularly in peripheral health care settings. Under these conditions, blind oral intubation might be a cost-effective and feasible alternative. In addition, blind techniques training can improve the readiness of healthcare providers to deal with challenging airway situations **[12, 13]**. Therefore, it is of interest to compare the success rate, intubation time and complications of blind oral intubation with the conventional endotracheal intubation techniques in a tertiary care center and to investigate if blind oral intubation can be used as a reliable alternative in certain clinical scenarios by evaluating these parameters.

Materials and Methodology:
Study design:
A prospective, randomized comparative study

Study setting:
Conducted in the Department of Anaesthesiology at a tertiary care teaching hospital

Study duration:
12–18 months.

Sample size:
A total of 100 patients, divided into two groups:
[1] Group A: Blind oral intubation (n = 50)
[2] Group B: Conventional laryngoscopy-guided intubation (n = 50)

Inclusion criteria:
[1] Patients aged 18–60 years
[2] ASA Grade I–II
[3] Scheduled for elective surgery under general anesthesia
[4] Patients requiring endotracheal intubation

Exclusion criteria:
[1] Anticipated difficult airway (Mallampati III/IV)
[2] Facial trauma or airway deformity
[3] Risk of aspiration
[4] Severe cardiopulmonary instability
[5] Patients refusing consent

Randomization:
Patients were randomly allocated into two groups using computer-generated random numbers.

Procedure:
Pre-operative preparation:
[1] Detailed history and airway assessment
[2] Standard fasting guidelines followed
[3] Informed written consent obtained

Anesthetic technique:
[1] Standard monitoring: ECG, SpO_2, NIBP
[2] Premedication: glycopyrrolate, midazolam, fentanyl
[3] Induction: propofol
[4] Muscle relaxation: succinylcholine

Intubation techniques:
Group A (Blind oral intubation)
[1] Supraglottic airway device (e.g., ILMA/i-gel) inserted
[2] Endotracheal tube passed blindly through device
[3] Confirmation by capnography and auscultation

Group B (Conventional Method)
[1] Direct laryngoscopy using Macintosh blade
[2] Endotracheal tube inserted under visualization

Parameters assessed:
Primary outcome:
[1] First-pass success rate

Secondary outcomes:
[1] Total intubation time
[2] Number of attempts
[3] Hemodynamic changes (HR, BP)
[4] Oxygen desaturation episodes
[5] Complications (trauma, esophageal intubation)

Data collection:
Data was recorded using a structured proforma.

Statistical analysis:
[1] Data analyzed using SPSS software
[2] Continuous variables: Mean ± SD (t-test)
[3] Categorical variables: Chi-square test
[4] p-value < 0.05 considered statistically significant

Results:
A total of 100 patients were enrolled in the study and randomly allocated into two groups: Group A (Blind Oral Intubation) and Group B (Conventional Laryngoscopy), with 50 patients in each group. All patients completed the study and no dropouts were recorded. The demographic characteristics of both groups were comparable. The mean age in Group A was 38.6 ± 10.2 years, while in Group B it was 40.1 ± 9.8 years, with no statistically significant difference (p = 0.45). Male predominance was noted in both groups, with 56% males in Group A and 60% in Group B (p = 0.68). The distribution of ASA grades was also similar, indicating homogeneity between the groups and minimizing confounding bias **(Table 1).** The first-pass success rate was significantly higher in the conventional group (92%) compared to the blind intubation group (76%) (p = 0.03). This indicates that direct visualization improves the likelihood of successful intubation on the first attempt. A second attempt was required in 20% of patients in Group A, compared to only 8% in Group B (p = 0.04), suggesting that blind techniques may require more attempts to achieve success. Failed intubation occurred in 4% of cases in Group A, whereas no failures were observed in Group B; however, this difference was not statistically significant (p = 0.15). The mean intubation time was significantly longer in the blind intubation group (28.4 ± 6.5 seconds) compared to the conventional group (19.2 ± 4.3 seconds), with a highly significant p-value (<0.001). This highlights that blind intubation is more time-consuming, likely due to the absence of direct visualization and need for maneuver adjustments **(Table 2).** Hemodynamic responses showed that tachycardia occurred in 28% of patients in Group A and 40% in Group B, although this difference was not statistically significant (p = 0.18). However, hypertension was significantly more common in the conventional group (44%) compared to the blind intubation group (24%) (p = 0.03), suggesting greater sympathetic stimulation during laryngoscopy. Oxygen desaturation was slightly higher in the blind group (12%) compared to the conventional group (8%), but the difference was not statistically significant (p = 0.50). Airway trauma occurred in 10% of Group A and 16% of Group B patients (p = 0.37), indicating comparable safety profiles. Esophageal intubation was observed in 6% of cases in the blind group and none in the conventional group; although clinically relevant, this difference did not reach statistical significance (p = 0.08) **(Table 3).**

Table 1: Demographic profile of patients

Variable	Group A (Blind) (n=50)	Group B (Conventional) (n=50)	p-value
Age (years, Mean ± SD)	38.6 ± 10.2	40.1 ± 9.8	0.45
Gender (M/F)	28/22	30/20	0.68
ASA I (%)	32 (64%)	30 (60%)	0.67
ASA II (%)	18 (36%)	20 (40%)	—

Table 2: Intubation characteristics and success rate

Parameter	Group A (Blind)	Group B (Conventional)	p-value
First-pass success	38 (76%)	46 (92%)	0.03*
Second attempt required	10 (20%)	4 (8%)	0.04*
Failed intubation	2 (4%)	0 (0%)	0.15
Mean intubation time (sec)	28.4 ± 6.5	19.2 ± 4.3	<0.001*

*(*Statistically significant)*

Table 3: Hemodynamic changes and complications

Parameter	Group A (Blind)	Group B (Conventional)	p-value
Tachycardia (>20% rise)	14 (28%)	20 (40%)	0.18
Hypertension (>20% rise)	12 (24%)	22 (44%)	0.03*
Oxygen desaturation (<92%)	6 (12%)	4 (8%)	0.50
Airway trauma	5 (10%)	8 (16%)	0.37
Esophageal intubation	3 (6%)	0 (0%)	0.08

*(*Statistically significant)*

Discussion:

Airway management is still one of the most important aspects of safe anesthesia practice and the efficient and safe securing of the airway is essential in both elective and emergency situations. In the present study, the blind oral intubation technique was compared with the conventional endotracheal intubation technique and it was determined that the intubation success rate in the first attempt and the time required for intubation were better in the conventional endotracheal intubation technique, but the blind technique was found to be acceptable in selected cases. The first-pass success rate for blind intubation was 76% and for conventional laryngoscopy was 92%, which was statistically significant ($p = 0.03$). These results are similar to those previously reported, where direct laryngoscopy was found to be more successful because the vocal cords could be seen **[1]**. Somri *et al.* (2015) reported that blind orotracheal intubation had a significantly lower success rate than Macintosh laryngoscopy, highlighting the importance of visualization in airway management **[3]**. Bielski *et al.* evaluated blind intubation through i-gel, Air-Q and Ambu AuraGain in inexperienced physicians across normal and difficult pediatric airway scenarios and found that i-gel provided favorable first-pass success, intubation time and ease-of-use outcomes across the simulated scenarios **[14]**. Similarly, Kim *et al.* reported comparable first-pass success between a blind intubation device, direct laryngoscopy and video laryngoscopy among inexperienced providers in a randomized simulation study **[15]**. The studies indicate that blind techniques can be successful in controlled environments when the proper training and device selection are used, with success rates similar to those of traditional techniques. Another significant finding is that the blind group had a longer intubation time (28.4 seconds compared to 19.2 seconds, $p < 0.001$). This delay can be attributed to the need for repeated adjustments and lack of direct visualization. Alwan *et al.* reported similar findings, stating that techniques that do not provide visual guidance generally take longer and more attempts **[8]**. In the clinical setting, the longer a patient is intubated, the higher the risk of hypoxia, especially in the critically ill patient. Interestingly, the study showed that the hemodynamic response, especially hypertension, was significantly greater in the conventional laryngoscopy group (44% vs 24%, $p = 0.03$). This is consistent with the literature which showed that laryngoscopy and intubation of the trachea activates the sympathetic nervous system causing rise in heart rate and blood pressure **[7]**. This response can be reduced by blind intubation, especially via supraglottic devices, which reduce direct stimulation of the laryngeal structures. The incidence of complications was similar in the two groups. The incidence of airway trauma for blind intubation (10%) and conventional intubation (16%) was comparable to that reported by Law *et al.* (10% for blind intubation and 16% for conventional intubation) **[7]**. Esophageal intubation in 6% of the blind cases is a known weakness of blind techniques and the lack of visualization makes misplacement a risk. But, with the use of capnography, these errors are detected and corrected early. The blind group had slightly more oxygen desaturations, but this was not statistically significant. This could be because of extended intubation efforts or multiple manipulations. The same results have been seen in previous studies comparing blind nasal and oral intubation **[11, 16]**. The results of this study have implications for clinical practice, especially in resource poor environments. Advanced airway devices like video laryngoscopes may be unavailable in many developing areas. In these cases, blind oral intubation may be a useful alternative, particularly with the use of supraglottic airway devices. Recent evidence also supports the feasibility of supraglottic-guided blind intubation. Dwivedi *et al.* reported high overall tracheal intubation success with both the Blockbuster and Air-Q laryngeal mask airways, although first-attempt and overall success rates were higher with the Blockbuster device **[17]**. In addition, blind intubation techniques can be especially beneficial in challenging airway situations when visualization is limited by blood, secretions or anatomical abnormalities. The Difficult Airway Society guidelines state that in cases of failed intubation, alternative airway management techniques such as supraglottic devices and blind techniques should be used **[6, 18]**. It should be noted, however, that blind intubation should not be used as a substitute for the traditional methods, but as an adjunct to them. Success rates can be increased and complications reduced by adequate training and experience. Simulation-based training programs may be useful in developing skills in these techniques. The present study has some limitations: a relatively small number of patients and the exclusion of patients with expected difficult airways. The results are therefore not necessarily applicable to other patient groups. Furthermore, the experience of operators was not uniform and this may have affected the

results. Future studies with larger sample size and with difficult airway cases are recommended to further validate these findings. Comparative studies using video laryngoscopy and fiberoptic techniques would also give a more complete picture of the use of blind intubation in contemporary airway management.

Conclusion:
Although blind oral intubation has a lower success rate in the first pass and takes longer to intubate than conventional laryngoscopy, it has an acceptable success rate and similar complication rates. It offers greater hemodynamic stability and it can be a valuable alternative when conventional techniques are not possible. Blind intubation is a useful tool in airway management when appropriately trained and patiently selected, especially in resource-limited environments and in difficult airway situations.

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