Comparison of Effects of Laryngeal Mask Airway Supreme Cuff Inflation with Air, Air: Oxygen Mixture, and Oxygen: Nitrous Oxide Mixture in Adults: A Randomized Double-blind Study

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INTRODUCTION

Airway devices including laryngeal mask airway (LMA) have cuffs which are permeable to various gases depending on their solubility and partial pressures. Nitrous oxide (N₂O)
is an inhalational anesthetic that is frequently used for
general anesthesia. However, N\textsubscript{2}O increases the intracuff
pressure due to diffusion of N\textsubscript{2}O into the cuff during
general anesthesia.\textsuperscript{[1]} Intracuff pressure during anesthesia
is also affected by various factors such as composition
and thickness of cuff material and gases used to inflate
the cuff. Intracuff pressure increases steadily and reaches
a level high enough to impede the microcirculation in the
tracheal mucosa within 1 h\textsuperscript{[2,3]} which may cause damage
to the tracheal tissue. Thus, LMA cuff pressure has been
implicated as a prime reason for a post-operative sore
throat. A number of studies suggested that manometer
should be used to monitor cuff pressure intraoperatively.\textsuperscript{[4]}

Several methods have been described to prevent an increase
in cuff pressure including filling the cuff with anesthetic
gas mixture\textsuperscript{[5,6]} or saline\textsuperscript{[7]} partial cuff deflation technique,
intracuff pressure monitoring, or limiting to the pressure
at which the seal occurs.

We have planned this study keeping in mind that use of
air only, O\textsubscript{2}: N\textsubscript{2}O mixture, and air: O\textsubscript{2} mixture as LMA
cuff inflating medium leads to cuff pressure changes and
affects the post-operative pharyngolaryngeal morbidity,
and by proper monitoring of cuff pressure, we can get to
know which gas mixture used in anesthesia could provide
stable and better intracuff pressures resulting in decreased
incidence of post-operative sore throat.

### Statistical Analysis

The sample size was calculated keeping in view at most 5%
risk, with minimum 85% power, and 5% significance level
(significant at 95% confidence interval). Raw data were
recorded in a Microsoft Excel spreadsheet and analyzed
using Statistical Package for the Social Sciences (SPSS
version 23.00). The continuous data were presented as
mean with standard deviation (mean ± SD). Number of
patients and/or percentage of cases expressed discrete
categorical data. Categorical variables were analyzed using
Chi-square test. Normally distributed continuous variables
were analyzed using independent sample t-test. Power
analysis was done to compare cuff pressure by taking α
error of 5% and beta error of 20%. The power achieved
was well above 90%. The blinding was opened at the end
of the study.

### MATERIALS AND METHODS

After obtaining approval from the Institutional Ethics
Committee, along with written and informed consent, a
total of 120 adults of either sex belonging to American
Society of Anesthesiologists (ASA) Grades I and II
aged 18–60 years and scheduled to undergo general
anesthesia were enrolled in a prospective randomized,
double-blind, comparative study. Patients with inadequate
mouth opening, body mass index >35 kg/m\textsuperscript{2}, anticipated
difficult airway, patient having increased risk of aspiration
such as gastroesophageal reflux disease, hiatus hernia,
oropharyngeal pathology, ASA Grades III and IV, cervical
spine pathology, and pregnancy were excluded from the
study.

The study included a total of 120 patients which were
selected randomly through computerized software
[Figure 1]. The patients were further divided into three
Ranjana, et al.: LMA Supreme Cuff Inflation with Different Gas Mixtures

1. The
2. 
3. : 500 ml N₂O, 2
4. O (50:50) with 
5. table 
6. graph 
7. P 
8. table 
9. st 
10. 2
11. O and then gradually 
12. O toward the end of surgery. Intracuff 
13. O with the help of aneroid cuff pressure manometer 
14. ic parameters, the patients in the 
15. graph 
16. 2
17. is given to the patient. 
18. at 5 L fresh 
19. st 
20. in subjects 
21. O is switched off and 100% O 
22. 2
23. O which again 
24. 2
25. gas flow composition was changed to O 
26. carbon dioxide (EtCO₂) 
27. Ventilatory settings were adjusted to maintain end-tidal 
28. Volume controlled ventilation was initiated, and initial 
29. valve at a fixed gas flow of 3 L/min. The airway pressure 
30. at which leak was heard (by stethoscope) was noted. 
31. Volume controlled ventilation was initiated, and initial ventilatory settings were adjusted to maintain end-tidal carbon dioxide (EtCO₂) between 35 and 45 mmHg. Fresh gas flow composition was changed to O₂:N₂O (50:50) with desflurane (0.8–1.4 minimum alveolar concentration) at 3 L for initial 5 min, then subsequently, flow was reduced to 1 L/min (500 ml O₂: 500 ml N₂O).

The cuff pressure and ventilator parameters were noted every 5 min for the first 30 min and then every 10 min until N₂O is switched off and 100% O₂ is given to the patient.

At the end of surgery, inj. myopyrolate (neostigmine + glycopyrrolate) 0.04–0.06 mg/kg was given as reversal. When the patient was awake and following commands, LMA supreme was removed, inflated. Parameters such as the presence of blood stain on the cuff, attempts for LMA supreme insertion, ease of insertion, use of Guedel’s airway (due to difficult mask ventilation or to relieve post-operative upper airway obstruction), aspirated volume of gas from the LMA supreme cuff, and laryngospasm were noted. Oral suction was avoided as far as possible and if done was noted.

The patient was then shifted to the post-anesthesia care unit. After surgery, pharyngolaryngeal complications, consisting of a sore throat, dysphonia, and dysphagia were assessed at 1st, 2nd, 12, and 24 h postoperatively. The predetermined definitions of pharyngolaryngeal complications were used for the assessment. The post-operative sore throat pain was treated by intravenous fentanyl 1–1.5 µg/kg in titrated doses according to the patient’s comfort. Patient satisfaction scores using visual analog scales (VAS) score was assessed at 1st, 2nd, 12, and 24 h postoperatively.

RESULTS

With respect to the demographic parameters, the patients in the three groups were analogous as is evident from Table 1. The mean duration of surgery was 58.97 ± 12.88 min in Group A, 60.35 ± 11.05 min in Group AO, and 53.77 ± 9.07 min in Group ON. The difference was statistically nonsignificant (P > 0.05). Hemodynamic and ventilatory parameters were also found statistically and clinically insignificant (P > 0.05).

In our study in Group A, we observed a significant and progressive increase in mean cuff pressures from 40 cm H₂O to 74.35 ± 7.41 cm H₂O until the end of the surgery. In Group OA, cuff pressure increased significantly until 25 min to mean of 60.23 ± 3.70 cm H₂O and then gradually decreased to mean 56.35 ± 3.63 cm H₂O until the end of surgery. Intracuff pressures were almost stable in subjects belonging to Group ON during the course of anesthesia. An initial decrease in cuff pressure was observed at 15 min to a mean of 32.85 ± 1.42 cm H₂O which again gradually increased to near initial pressures to a mean of 40.10 ± 2.31 cm H₂O toward the end of surgery. Intracuff pressure was found to be statistically significant between the three groups (P < 0.05) [Table 2].
Duration of low flow anesthesia (minutes) mean±SD

<table>
<thead>
<tr>
<th>Duration (minutes)</th>
<th>Group A (air)</th>
<th>Group AO (air:Oxygen)</th>
<th>Group ON (Oxygen:Nitrous oxide)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>38.75±1.10</td>
<td>40.13±1.12</td>
<td>39.13±1.92</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>5</td>
<td>42.88±5.72</td>
<td>44.58±1.20</td>
<td>36.65±1.08</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>10</td>
<td>54.30±6.58</td>
<td>47.48±1.47</td>
<td>34.73±1.18</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>15</td>
<td>57.70±5.96</td>
<td>50.73±2.05</td>
<td>32.85±1.42</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>20</td>
<td>60.75±4.78</td>
<td>54.33±2.80</td>
<td>34.80±1.42</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>25</td>
<td>61.95±5.11</td>
<td>60.23±3.70</td>
<td>36.53±1.28</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>30</td>
<td>63.15±4.48</td>
<td>59.55±3.79</td>
<td>37.78±1.42</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>40</td>
<td>64.45±4.86</td>
<td>58.15±3.87</td>
<td>38.48±2.14</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>50</td>
<td>68.00±6.63</td>
<td>57.88±4.69</td>
<td>38.98±2.45</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>60</td>
<td>69.28±7.08</td>
<td>57.63±5.72</td>
<td>39.30±4.93</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>70</td>
<td>71.73±7.59</td>
<td>57.23±4.90</td>
<td>39.55±4.51</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>80</td>
<td>72.68±8.62</td>
<td>56.93±3.03</td>
<td>39.73±3.95</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>90</td>
<td>73.08±8.38</td>
<td>56.83±3.31</td>
<td>40.03±3.25</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>&gt;90</td>
<td>74.35±7.41</td>
<td>56.35±3.63</td>
<td>40.18±2.31</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

A minimal effective cuff inflating volume was used to achieve the LMA cuff pressure of 40 cm H₂O in our study. The initial volume of gas used to inflate LMA Supreme in Group A, Group AO, and Group ON was 13.98 ± 1.83 ml, 13.08 ± 2.28 ml, and 15.63 ± 2.18 ml which was enough to reach the desired pressure of up to 40 cm H₂O. In Group A and Group AO, mean difference between initial and final intracuff volume was observed to be 9.38 ± 4.27 ml and 5.08 ± 1.87 ml. In Group ON, mean difference between initial and final intracuff volume observed was 4.13 ± 1.24 ml. A significant difference between initial and final intracuff volume was observed in three groups (P < 0.05) [Table 3].

The incidence of a sore throat, dysphagia, and dysphonia was higher in Group A at 1st, 2nd, 12, and 24 h postoperatively in comparison to Group AO and Group ON. A significant difference in a sore throat, dysphagia was observed between Group A and Group ON in our study. Reduced post-operative morbidity (sore throat, dysphagia, and dysphonia) was observed in Group ON (<0.05). A more stable intracuff pressure trend observed in Group ON was directly related to decrease in the incidence of post-operative pharyngolaryngeal morbidity in this group. In our study, a significant difference in dysphonia was observed between Group A and Group ON at 1st h postoperatively. However, dysphonia at 2nd, 12, and 24 h was found to be statistically insignificant (P > 0.05) [Table 4].

VAS was measured postoperatively for a sore throat at 1st, 2nd, 12, and 24 h. Mean VAS scores for Group ON were observed to be 3 at a 1st h, 3 at 2nd h, 1 at 12 h, and 1 at 24 h postoperatively. The mean VAS scores for Group A and Group AO were observed to be 4.4 at 1st h, 3.3 at 2nd h, 3.2 at 12 h, and 3.2 at 24 h postoperatively. There was a significant difference in sore throat pain score between three groups (P < 0.05) and sore throat pain score was comparatively lower in Group ON at the end of 1st, 2nd, 12, and 24 h postoperatively [Table 5].

Rescue analgesia in the form of injection fentanyl 1–1.5 mcg/kg was given in patients with VAS >3 at 1st, 2nd, 12, and 24 h. The result was highly significant in terms of the need for rescue analgesia in Group ON/Group A (<0.05) at a 1st h. Due to the limited duration of action and recurrence of throat pain injection fentanyl were repeated at 2nd, 12, and 24 h according to the patient’s complaint. In Group ON at 1st h postoperatively 6 patients were given rescue analgesia. 5 patients were given rescue analgesia at 2nd h. 3 patients and 1 patient were given rescue analgesia at 12 h and 24 h, respectively.

**DISCUSSION**

Air is most commonly used to inflate the cuff. Nitrous oxide (N₂O) is the least potent and the oldest inhaled anaesthetic which has the property to diffuse into air-filled cavities and also through the semipermeable membrane of LMAs cuff, thereby gradually increasing the cuff pressures. High intracuff pressure can cause severe pharyngolaryngeal complications including a sore throat or hoarseness after LMA removal postoperatively. Although the application of minimum effective cuff inflating volume is suggested to maintain airway sealing and adequacy of ventilation for patients receiving general anesthesia with LMA at a lower level of the intracuff pressure, it is currently not standard care in most of the anesthetic departments.

Thus, the study was carried out keeping in mind that use of O₃₂:N₂O:Air:O₂ and air only as LMA cuff inflating medium leads to cuff pressure changes and effects the post-operative pharyngolaryngeal morbidity. LMA cuff pressure is an inherent risk factor for the development of this common complication, yet a number of techniques can reduce the incidence. Airway devices have cuffs which are permeable to a variety of gases depending on their partial pressure and solubility. The composition and thickness of the cuff material...
latex, silicone or polyvinyl chloride) play a significant role in the intracuff pressure changes during anesthesia.

All the three groups were compared with respect to changes in cuff pressure intraoperatively with a manometer and effect of LMA Supreme cuff pressure change on intraoperative ventilatory and hemodynamic parameters. Post-operative pharyngolaryngeal morbidity in the form of a sore throat, dysphagia, dysphonia, and rare complications of LMA insertion such as recurrent laryngeal nerve palsy, hypoglossal nerve palsy, and lingual nerve palsy was noted.

In our study, there was a significant difference in cuff pressure in Group A, AO, and ON. The cuff pressure was noted every 5 min for the first 30 min and then every 10 min until N₂O was switched off. In Group A, we observed a significant and progressive increase in mean cuff pressures from 40 cm H₂O to 74.35 ± 7.41 cm H₂O until the end of the surgery. Similar increase in intracuff pressure was observed under N₂O: O₂ anesthesia in a study by Pallavi et al. in 2018 where cuff pressure and volume achieved at the end of surgery were much higher in air group as compared to lignocaine group (P < 0.05).

Despite filling the ET cuff with air at below critical initial cuff pressure of 30 cm H₂O, there was an increase in mean cuff pressure to 49.86 ± 0.72 cm H₂O toward the end of surgery.

In Group AO, cuff pressure increased significantly until 25 min to mean of 60.23 ± 3.70 cm H₂O and then gradually decreased to mean 56.35 ± 3.63 cm H₂O until the end of surgery. There has been not much literature to evaluate the effect of O₂ and air mixture on cuff pressure. However, a study by Mona et al. in 2016 found similar results where LMA Proseal cuff inflation with O₂: Air mixture increased the cuff pressure at 5 min which became statistically significant.

### Table 2: Cuff pressure monitoring in intaoperative period

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (Mean±SD)</th>
<th>Group AO (Mean±SD)</th>
<th>Group ON (Mean±SD)</th>
<th>t-value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>13.98±1.83</td>
<td>13.08±2.28</td>
<td>15.63±2.18</td>
<td>1.36</td>
<td>0.03</td>
</tr>
<tr>
<td>Final</td>
<td>23.18±4.45</td>
<td>18.73±2.61</td>
<td>11.50±1.93</td>
<td>5.20</td>
<td>0.00</td>
</tr>
<tr>
<td>Difference</td>
<td>9.38±4.27</td>
<td>5.08±1.87</td>
<td>4.13±1.24</td>
<td>5.11</td>
<td>0.00</td>
</tr>
<tr>
<td>Percentage change</td>
<td>64.11±17.97</td>
<td>39.67±13.19</td>
<td>26.52±6.38</td>
<td>6.33</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Table 3: Intracuff volume variation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A (Mean±SD)</th>
<th>Group AO (Mean±SD)</th>
<th>Group ON (Mean±SD)</th>
<th>t-value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>13.98±1.83</td>
<td>13.08±2.28</td>
<td>15.63±2.18</td>
<td>1.36</td>
<td>0.03</td>
</tr>
<tr>
<td>Final</td>
<td>23.18±4.45</td>
<td>18.73±2.61</td>
<td>11.50±1.93</td>
<td>5.20</td>
<td>0.00</td>
</tr>
<tr>
<td>Difference</td>
<td>9.38±4.27</td>
<td>5.08±1.87</td>
<td>4.13±1.24</td>
<td>5.11</td>
<td>0.00</td>
</tr>
<tr>
<td>Percentage change</td>
<td>64.11±17.97</td>
<td>39.67±13.19</td>
<td>26.52±6.38</td>
<td>6.33</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### Table 4: ST AT 1st, 2nd, 12 and 24-hour post operatively

<table>
<thead>
<tr>
<th>Sore throat (hour)</th>
<th>Group A (n (%))</th>
<th>Group AO (n (%))</th>
<th>Group ON (n (%))</th>
<th>Total (n (%))</th>
<th>A/AO</th>
<th>AO/ON</th>
<th>A/ON</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st h</td>
<td>16 (40.00)</td>
<td>12 (30.00)</td>
<td>6 (15.00)</td>
<td>34 (28.40)</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>2nd h</td>
<td>14 (35.00)</td>
<td>10 (25.00)</td>
<td>5 (12.50)</td>
<td>29 (24.16)</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>12 h</td>
<td>10 (25)</td>
<td>7 (17.50)</td>
<td>3 (7.50)</td>
<td>20 (16.60)</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>24 h</td>
<td>7 (17.50)</td>
<td>5 (12.50)</td>
<td>1 (2.50)</td>
<td>13 (10.83)</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

St: Sore throat

### Table 5: VAS score for sore throat in post operative

<table>
<thead>
<tr>
<th>Time in hours</th>
<th>Group A (Mean±SD)</th>
<th>Group AO (Mean±SD)</th>
<th>Group ON (Mean±SD)</th>
<th>t-value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.38±0.59</td>
<td>4.15±0.58</td>
<td>3.20±0.41</td>
<td>1.02</td>
<td>0.04</td>
</tr>
<tr>
<td>2</td>
<td>3.38±0.54</td>
<td>3.18±0.45</td>
<td>3.00±0.39</td>
<td>1.77</td>
<td>0.04</td>
</tr>
<tr>
<td>12</td>
<td>3.18±0.38</td>
<td>2.20±0.41</td>
<td>1.10±0.30</td>
<td>10.03</td>
<td>0.00</td>
</tr>
<tr>
<td>24</td>
<td>2.25±0.49</td>
<td>1.18±0.38</td>
<td>1.05±0.22</td>
<td>11.58</td>
<td>0.00</td>
</tr>
</tbody>
</table>

VAS: Visual analog scales

(quantitative scales)
Intracuff pressures were almost stable in subjects belonging to group ON during the course of anesthesia. An initial decrease in cuff pressure was observed at 15 min to a mean of 32.85 ± 1.42 cm H$_2$O which again gradually increased to near initial pressures to a mean of 40.10 ± 2.31 cm H$_2$O toward the end of surgery [Figure 2]. It is hypothesized that when LMA Supreme cuff is inflated with 50% N$_2$O, it creates a pressure above the atmospheric pressure at 40 cm H$_2$O which leads to a pressure gradient between the inside and outside of the cuff resulting in the diffusion of N$_2$O out of the cuff resulting in an initial decrease in pressure and volume. The results are consistent with that of an earlier study done in 2017 by Puneeth et al. where cuff inflation with N$_2$O: O$_2$ resulted in a significant decrease in intratracheal cuff pressure from 30 cm H$_2$O to mean pressure of 24.10 ± 0.90 cm H$_2$O at the end of 90 min in comparison to increased mean cuff pressures with air ($P < 0.001$).[10] Shenoy et al. stated that the practice of using 50% N$_2$O: O$_2$ for filling endotracheal tube cuff facilitates an inexpensive method for providing safe and stable cuff pressures during anesthesia.[11]

A minimal effective cuff inflating volume was used to achieve the LMA cuff pressure of 40 cm H$_2$O in our study. The volume of gas used to inflate LMA Supreme in Group A, Group AO, and Group ON was 13.98 ± 1.83 ml, 13.08 ± 2.28 ml, and 15.63 ± 2.18 ml which was enough to reach the desired pressure of up to 40 cm H$_2$O. Furthermore, a significant difference in the initial and final aspirated volume was observed in our study in all three groups [Figure 3]. Intracuff volume variation was more in Group A in comparison to Group AO whereas the least change in cuff volume was observed in Group ON. Mitchell et al. observed a progressive decrease in cuff pressure and final cuff volume when a gas mix (O$_2$: N$_2$O) was used to inflate the cuff.[11]

A significant difference in a sore throat, dysphagia was observed between Group A and Group ON in our study. Reduced post-operative morbidity (sore throat, dysphagia, and dysphonia) was observed in Group ON (<0.05). A more stable intracuff pressure trend observed in Group ON was directly related to decrease in the incidence of post-operative pharyngolaryngeal morbidity in this group. We also assessed the intensity of sore throat pain in three groups using VAS. Our study showed mean VAS scores for Group ON being 3 at 1$^{st}$ h, 3 at 2$^{nd}$ h, 1 at 12 h, and 1 at 24 h postoperatively. The mean VAS scores for Group A and Group AO were observed to be 4.4 at 1$^{st}$ h, 3.3 at 2$^{nd}$ h, 3.2 at 12 h, and 3.2 at 24 h postoperatively. There was a significant difference in sore throat pain score between three groups ($P < 0.05$) and sore throat pain score were comparatively lower in Group ON at the end of 1$^{st}$, 2$^{nd}$, 12, and 24 h postoperatively.

Rescue analgesia in the form of injection fentanyl 1–1.5 mcg/kg was given in patients with VAS >3 at 1$^{st}$, 2$^{nd}$, 12, and 24 h. In Group A, 16 patients required rescue analgesia at 1$^{st}$ h, 14 patients at a 2$^{nd}$ h, and 12.7 patients at 12 and 24 h postoperatively. A significant difference in the patients requiring rescue analgesia was observed at 1$^{st}$, 2$^{nd}$, 12, and 24 h ($P < 0.05$) postoperatively and need was least in Group ON at 1$^{st}$ h due to the comparatively low

![Figure 2: Intracuff volume variation](image-url)
incidence of a sore throat resulting in better pain score in this group.

The unique distinction of our study is that we have also taken into account the potential known confounders for pharyngolaryngeal complications that are the ease of LMA insertion, number of attempts of LMA insertion, use of Guedel's type airway, incidence of laryngospasm, presence of blood on LMA Supreme after removal, and use of pharyngeal suctioning. These univariate predictors of a sore throat were found to be non-significant ($P > 0.05$) and were comparable in all the groups.

**LIMITATIONS**

Limitations of the study were the inability to assess the concentration of $N_2O$ inside the cuff at the start and end of general anesthesia as it would have given an idea of the concentration of $N_2O$ diffusion into and out of cuff and its effect on emergence phenomenon. Another limitation of our study was the lack of enough number of patients to estimate the impact of intracuff pressure on the incidence of rare and more serious complications of LMA insertion such as recurrent laryngeal nerve palsy, hypoglossal nerve palsy, and lingual nerve palsy. In our study, the duration of surgery taken was from 90 to 100 min. Hence, due to the uniformity in the duration of surgery in three groups, no conclusion can be drawn regarding the incidence of a sore throat related to the duration of anesthesia. A more detailed study with varying duration of the procedure is required to further substantiate our findings. Furthermore, the correct position of LMA was not confirmed by fiberoptic bronchoscopy.

**CONCLUSION**

Thus, from our study, we are clearly able to conclude that the rise of cuff pressure with the progression of surgery during general anesthesia ($N_2O: O_2$) is better overcome when LMA Supreme is inflated with $N_2O: O_2$ mixture as compared to air and air: $O_2$ mixture. The practice of using 50% $N_2O: O_2$ mixture for filling LMA Supreme facilitates an inexpensive method for providing safe and stable cuff pressure during anesthesia and an improved protective effect in preventing post-operative pharyngolaryngeal morbidity in the form of sore throat, dysphagia, and dysphonia. Furthermore, we are able to show a clear benefit from the use of manometer after insertion of LMA Supreme to reduce pharyngolaryngeal complications.
From our study, we can say that N₂O:O₂ mixture provides a safe and stable cuff pressure during N₂O:O₂ anesthesia in comparison to other cuff inflating mediums. Thus, N₂O:O₂ mixture can be used as an inexpensive medium for cuff inflation and prevention of post-operative laryngopharyngeal morbidities. However, limited data are available, and more future studies need to be done so as to prove the same.