A COMPARATIVE STUDY OF INTRAVENOUS LIDOCAINE AND INTRAVENOUS SUFENTANIL IN ATTENUATING THE HEMODYNAMIC RESPONSE TO LARYNGOSCOPY AND TRACHEAL INTUBATION.

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ABSTRACT : BACKGROUND AND OBJECTIVES : Laryngoscopy and tracheal intubation in adults cause stress response manifested by a rise in heart rate and blood pressure. Intravenous lidocaine has been used to suppress this stress response. Sufentanil a opioid, a fentanyl congener is being increasingly used to attenuate this response. In this clinical comparative study we compared these two drugs in attenuating the stress response to laryngoscopy and intubation.

We compared the effects of intravenous lidocaine against sufentanil in attenuating the hemodynamic response to laryngoscopy and intubation in relation to

- Heart rate
- Blood pressure-systolic and diastolic
- Mean arterial pressure
- Rate pressure product-heart rate multiplied by systolic blood pressure

METHODS : 100 patients belonging to ASA1 and ASA2 posted for surgeries under general anesthesia were randomly divided in a double blind fashion into 2 groups of 50 each. Both groups were premedicated with intravenous glycopyrolate 0.005mg/kg and midazolam 1mg. Group A received intravenous lidocaine 2% 1.5mg/kg and group B received 0.2µg/kg sufentanil 3 minutes before laryngoscopy and intubation. Both groups were induced with 2.5% thiopentone 5 mg/kg and 1.5mg/kg succinylcholine. Laryngoscopy was done and intubation accomplished within 20 seconds. Heart rate, blood pressure, mean arterial pressure were recorded before induction (baseline) and at 1, 3, 5 and 10 min after intubation. Statistical analysis was done using student’s t test (paired) and P value obtained. RESULTS : Both groups showed attenuation of stress response. Maximum increase in heart rate in lidocaine group was at 3rd minute a 18.6% increase from baseline and maximum increase in sufentanil group was at 1st minute a 12.09% increase from baseline. It was clinically and statistically significant (P<0.001). Maximum increase in systolic blood pressure in lidocaine group was 22.8% from baseline and in sufentanil group it was only 12.15% (P<0.005). Sufentanil group showed a earlier fall in all the parameters to the baseline value compared to lidocaine group.

INTERPRETATION AND CONCLUSION: Both sufentanil and lidocaine attenuate the stress response to laryngoscopy and intubation. When both these drugs were compared sufentanil attenuated the stress response to laryngoscopy and intubation better than lidocaine and afforded a good hemodynamic stability.

KEYWORDS: Anaesthesia ; hemodynamic ; sufentanil ; lidocaine ; laryngoscopy ; intubation.
INTRODUCTION: Laryngoscopy and intubation is a day to day routine in the practice of anesthesiology. It is not only performed for general anesthesia during elective and emergency surgeries as indicated, we are also called upon for securing airway in critical care. Both laryngoscopy and intubation are associated with physical trauma to oral cavity and elicit physiological response in the form of vago-vagal reflex predominantly seen in children and sympatho-adrenal response seen in adults.\(^1\)

This physiological response is transient lasting for five to ten minutes and is well tolerated by healthy adult patients. However in patients with ischemic heart disease, hypertension and cerebrovascular disease this stress response can have catastrophic effect on patients in the form of myocardial ischemia or cerebrovascular accident on table.\(^1\)

Cardio-vascular response to laryngoscopy and intubation involves a rise in systolic and diastolic blood pressure, tachycardia and cardiac dysrhythmias.\(^2\) The hemodynamic response is due to increased catecholamines (caused by increased sympatho-adrenal outflow) nor epinephrine, epinephrine and vasopressin.\(^3\) The rise in systemic blood pressure causes greater oxygen demand and oxygen consumption by cardiac muscle fibres and also increases coronary sinus blood flow.\(^4\) Electro cardio graphic changes seen are ST segment depressions, prolongation of PR interval, notching or slurring of QRS complexes.\(^5\)

With advances in medicine the number of elderly and high risk patients coming for elective surgeries has steadily increased over the years. Many strategies have been employed to minimize the adverse hemodynamic response to laryngoscopy and intubation\(^6\),

- Curtailing or shortening the duration of laryngoscopy to less than 15 seconds.
- Use of intravenous beta blockers, sodium nitroprusside, ACE inhibitors.
- Use of local lidocaine sprays and gargles.
- Use of intravenous lidocaine and intravenous opioids.

Intravenous lidocaine in varying doses has been shown to attenuate the stress response to laryngoscopy and intubation.\(^7\) Intravenous sufentanil an opioid, a congener of fentanyl, is also used in varying doses to attenuate the cardio-vascular stress response. Sufentanil also provides good hemodynamic stability both during laryngoscopy and intubation as well as during the peri-operative period.\(^8\) Intravenous lidocaine has shown varying results in attenuating the stress response to laryngoscopy and intubation including failure to attenuate the stress response.\(^9\)

There is not much literature comparing intravenous lidocaine and sufentanil in attenuating the hemodynamic stress response to laryngoscopy and intubation. Hence the present study was under taken to determine whether intravenous lidocaine 1.5mg/kg or intravenous sufentanil 0.2µg/kg given prior to laryngoscopy and intubation is superior in attenuating the hemodynamic stress response to laryngoscopy and intubation.

The present clinical study had the following objectives,

1. To compare the effects of intravenous lidocaine and intravenous sufentanil on hemodynamic response to laryngoscopy and intubation in relation to,
   - Heart rate
   - Blood pressure-systolic and diastolic
   - Mean arterial pressure
   - Rate pressure product
2. To ascertain the superiority of sufentanil over lidocaine or vice versa in attenuating the hemodynamic response to laryngoscopy and intubation.

**METHODOLOGY:** Hundred patients posted for elective surgeries requiring endotracheal intubation were included in the study to compare intravenous lidocaine and intravenous sufentanil in attenuating the hemodynamic response to laryngoscopy and intubation.

**INCLUSION CRITERIA**
1. Patients belonging to ASA 1 and ASA 2.
2. Age between 18 to 60 years of either sex
3. Scheduled for elective surgeries under general anesthesia.

**EXCLUSION CRITERIA**
Patients with history of
1. Hypertension.
2. Diabetes mellitus.
3. Cerebrovascular disease.
4. Renal and hepatic diseases.
5. Bronchial asthma.
6. Anatomical airway obstruction.
7. Any predicted difficult airway.

A detailed pre anesthetic evaluation was done one day prior to surgery and a written informed consent was taken for the study during the evaluation process. Patients were divided randomly into two groups of fifty each in a double blind fashion.

- **GROUP ‘A’** - LIDOCAINE
- **GROUP ‘B’** - SUFENTANIL

**PREMEDICATION:** On the day of surgery at 6:00am all patients received tab.alprazolam 0.5 mg and tab.ranitidine 150 mg orally with sips of water under the supervision of a nursing staff.

On receiving the patient to operating room pulse oximeter, ECG, noninvasive blood pressure from a DATEX OHMEDA monitor was connected. NIBP was set to manual mode and lead II ECG was selected for monitoring.

*Inj. midazolam 0.03 mg/kg i.v was given 10 minutes prior to induction. After 10 minutes a baseline recording of heart rate, systolic and diastolic blood pressure was noted down.*

**INDUCTION:** At the end of 10 minutes study drug as applicable was given. Patients were pre oxygenated for 3 minutes via a Bain's circuit and i.v glycopyrolate 0.005 mg/kg and i.v thiopentone sodium 2.5% 5 mg/kg was given. Ventilation was checked and confirmed and then i.v succinylcholine 1.5 mg/kg was given and ventilation continued for one more minute.

**LARYNGOSCOPY AND INTUBATION:** At the end of 1 minute gentle laryngoscopy was done and patient was intubated with appropriate sized endotracheal tube within 20 seconds. Bilateral air entry confirmed by auscultation and EtCO₂ was connected and cuff was inflated with appropriate volume of air and the endotracheal tube was fixed with adhesive tapes.
MAINTENANCE OF ANESTHESIA: Anesthesia was maintained with 67% N₂O and 33% O₂ with adequate flows and tidal volume by Bain’s circuit maintaining SPO₂ in the range 98% to 100% and EtCO₂ < 35 mm of Hg.

TIME FRAME FOR EACH DRUG ADMINISTERED

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>midazolam</td>
</tr>
<tr>
<td>10</td>
<td>study drug</td>
</tr>
<tr>
<td>11</td>
<td>thiopentone sodium</td>
</tr>
<tr>
<td>12</td>
<td>succinylcholine</td>
</tr>
<tr>
<td>13</td>
<td>laryngoscopy and intubation</td>
</tr>
</tbody>
</table>

GROUP ‘A’ - Received lidocaine 1.5 mg/kg 3 minutes prior to laryngoscopy²⁴.

GROUP ‘B’ - Received sufentanil 0.2 µg/kg 3 minutes prior to laryngoscopy²⁰,²⁵.

Readings of heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were taken at 1 minute, 3 minute, 5 minute and 10 minutes interval from onset of laryngoscopy. Later RPP-rate pressure product-the product of systolic blood pressure and heart rate was calculated for each time interval.

Positioning, painting, draping and packing of throat were not done during the study period.

Patients were strictly monitored for adverse effects of drugs and other anesthesia related problems and were attended promptly.

After the study period group A received fentanyl 2µg/kg for analgesia.

Post operatively patients were monitored for half an hour in the PACU and watched for respiratory depression especially in the sufentanil group.

STATISTICAL ANALYSIS: Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance was assessed at 5 % level of significance. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups. Student t test has been used to find the homogeneity of parameters on continuous scale and Chi-square test has been used to find the homogeneity of samples on categorical scale.

RESULTS:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>35.36±13.69</td>
<td>37.26±12.26</td>
<td>0.467</td>
<td>Samples are age matched</td>
</tr>
<tr>
<td>Gender; Male: Female</td>
<td>24:26</td>
<td>31:19</td>
<td>0.159</td>
<td>Samples Gender matched</td>
</tr>
<tr>
<td>Weight in kg</td>
<td>53.26±7.52</td>
<td>55.26±7.12</td>
<td>0.159</td>
<td>Samples are weight matched</td>
</tr>
</tbody>
</table>

Table 1: Comparison of basic clinical characteristics of patients studied
INTERPRETATION

Table 1: COMPARISON OF BASIC CLINICAL CHARACTERISTICS

The mean values and standard deviation of age in the two groups A and B were 35.36±13.69 and 37.26±12.26 respectively (P>0.05).

The mean values and standard deviation of weight in group A and group B were 53.26±7.52 and 55.26±7.12 (P>0.05).

The male to female ratios in group A and group B were 24:26 and 31:19 respectively (P>0.05).

We conclude that the sample studied are age, gender and weight matched.

<table>
<thead>
<tr>
<th>TYPES OF SURGERY</th>
<th>NUMBER</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthopedics</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>General surgery</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>Laparoscopy</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>ENT</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Gynecology</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Number of cases and type of surgeries

<table>
<thead>
<tr>
<th>Heart rate (bpm)</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>79.90±6.34</td>
<td>80.32±6.68</td>
<td>t=0.322;p=0.748</td>
</tr>
<tr>
<td>Onset of Laryngoscopy</td>
<td>96.98±12.76</td>
<td>93.22±10.88</td>
<td>t=1.586;p=0.116</td>
</tr>
<tr>
<td>At 1 min</td>
<td>98.02±10.74</td>
<td>92.38±9.94</td>
<td>t=2.726;p=0.008**</td>
</tr>
<tr>
<td>At 3 min</td>
<td>88.96±5.79</td>
<td>84.10±7.17</td>
<td>t=3.729;p&lt;0.001**</td>
</tr>
<tr>
<td>At 5 min</td>
<td>81.04±7.71</td>
<td>78.00±5.89</td>
<td>t=2.216;p=0.029*</td>
</tr>
<tr>
<td>At 10 min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Comparison of Heart rate in two groups of patients

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P ≤ 0.05)
** Strongly significant (P value: P<0.01)

Table 3

INTER GROUP COMPARISON: At 3, 5 and 10 minutes the percentage increase in mean heart rate from baseline were significantly lesser in sufentanil group than lidocaine group. At 3 and 5 minutes heart rate response to laryngoscopy and intubation in the sufentanil group is clinically lesser than lidocaine group and statistically highly significant (P=0.08 at 3 minute and P<0.001 at 5 minutes).

The fall to baseline value in the lidocaine group was at 9th minute and in sufentanil group at 7th minute and statistically it was significant (P<0.01) indicating sufentanil group showed earlier recovery to baseline values compared to lidocaine group.
### Table 4: Comparison of Systolic BP (mm Hg) in two groups of patients

<table>
<thead>
<tr>
<th>SBP (mm Hg)</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>127.96±11.16</td>
<td>126.48±10.23</td>
<td>t=0.691;p=0.491</td>
</tr>
<tr>
<td>Onset of Laryngoscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 1 min</td>
<td>143.5±17.24</td>
<td>135.58±11.67</td>
<td>t=2.69;p=0.008**</td>
</tr>
<tr>
<td>At 3 min</td>
<td>142.72±13.87</td>
<td>134.82±11.25</td>
<td>t=3.128;p=0.002**</td>
</tr>
<tr>
<td>At 5 min</td>
<td>135.32±10.41</td>
<td>128.44±10.57</td>
<td>t=3.279;p=0.001**</td>
</tr>
<tr>
<td>At 10 min</td>
<td>128.98±8.35</td>
<td>124.76±10.32</td>
<td>t=2.248;p=0.027*</td>
</tr>
</tbody>
</table>

Table 4

**INTER GROUP COMPARISON**: The percentage increase in mean systolic blood pressure at 1 minute, 3 minute, 5 minute and 10 minute time interval is clinically lesser in sufentanil group than in the lidocaine group. At 1, 3 and 5 minutes p values were P=0.008, P=0.002 and P=0.001 respectively and are statistically highly significant indicating sufentanil group attenuates the systolic blood pressure response to laryngoscopy and intubation better compared to lidocaine group. The fall to baseline value in the lidocaine group was at 8th minute and in sufentanil group at 6th minute and statistically it was significant (P<0.01) indicating sufentanil group showed earlier recovery to baseline values compared to lidocaine group.

### Table 5: Comparison of Diastolic BP (mm Hg) in two groups of patients

<table>
<thead>
<tr>
<th>DBP (mm Hg)</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>76.62±5.88</td>
<td>75.20±5.04</td>
<td>t=1.296;p=0.198</td>
</tr>
<tr>
<td>Onset of Laryngoscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At 1 min</td>
<td>84.00±6.39</td>
<td>80.04±5.69</td>
<td>t=3.271;p=0.001**</td>
</tr>
<tr>
<td>At 3 min</td>
<td>84.48±5.61</td>
<td>79.60±5.22</td>
<td>t=4.504;p&lt;0.001**</td>
</tr>
<tr>
<td>At 5 min</td>
<td>81.40±5.69</td>
<td>76.68±5.01</td>
<td>t=4.402;p&lt;0.001**</td>
</tr>
<tr>
<td>At 10 min</td>
<td>78.02±6.15</td>
<td>75.30±5.46</td>
<td>t=2.340;p=0.021*</td>
</tr>
</tbody>
</table>

Table 5

**INTER GROUP COMPARISON**: The percentage increase in diastolic blood pressure at 1 minute, 3 minute, 5 minute and 10 minute intervals from onset of laryngoscopy is clinically lesser in sufentanil group compared to lidocaine group. At 1, 3 and 5 minutes it is highly significant with values of...
P=0.001, P<0.001 and P<0.001 respectively. At 10 minute interval with P value equal to 0.021 is statistically significant.

<table>
<thead>
<tr>
<th>MAP (mm Hg)</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>93.65±6.36</td>
<td>92.52±5.88</td>
<td>t=0.914;p=0.363</td>
</tr>
<tr>
<td>Onset of Laryngoscopy</td>
<td>103.96±9.28</td>
<td>98.57±6.32</td>
<td>t=3.398;p&lt;0.001**</td>
</tr>
<tr>
<td>At 1 min</td>
<td>103.88±6.93</td>
<td>97.98±6.21</td>
<td>t=4.479;p&lt;0.001**</td>
</tr>
<tr>
<td>At 5 min</td>
<td>99.00±5.45</td>
<td>93.92±5.89</td>
<td>t=4.479;p&lt;0.001**</td>
</tr>
<tr>
<td>At 10 min</td>
<td>94.92±5.69</td>
<td>91.72±6.03</td>
<td>t=2.731;p=0.007**</td>
</tr>
</tbody>
</table>

Table 6: Comparison of MAP (mm Hg) in two groups of patients

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P ≤0.05)
** Strongly significant (P value: P<0.01)

INTERGROUP COMPARISON: The percentage increase in mean arterial blood pressure at 1, 3, 5 and 10 minutes time interval was significantly lesser in sufentanil group than in the lidocaine group from the onset of laryngoscopy. At all time intervals P<0.001 indicates it is statistically also highly significant. The fall to baseline value in the lidocaine group was at 10th minute and in sufentanil group at 8th minute and statistically it was significant (P<0.01) indicating sufentanil group showed earlier recovery to baseline values compared to lidocaine group.

<table>
<thead>
<tr>
<th>RPP</th>
<th>Group A</th>
<th>Group B</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>10168.68±1327.91</td>
<td>10218.86±1417.26</td>
<td>t=0.183;p=0.855</td>
</tr>
<tr>
<td>Onset of Laryngoscopy</td>
<td>14044.27±3208.32</td>
<td>12696.40±2075.90</td>
<td>t=2.487;p=0.015*</td>
</tr>
<tr>
<td>At 1 min</td>
<td>13924.30±2512.06</td>
<td>12511.60±1946.60</td>
<td>t=3.143;p=0.002**</td>
</tr>
<tr>
<td>At 3 min</td>
<td>12043.98±1293.35</td>
<td>10839.20±1437.40</td>
<td>t=4.406;p&lt;0.001**</td>
</tr>
<tr>
<td>At 5 min</td>
<td>10441.06±1235.41</td>
<td>9757.62±1318.51</td>
<td>t=2.675;p=0.009**</td>
</tr>
</tbody>
</table>

Table 7: Comparison of Rate pressure product in two groups of patients

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P ≤0.05)
** Strongly significant (P value: P<0.01)

Table 7 INTER GROUP COMPARISON: When both groups were compared at 3, 5 and 10 minutes P values were P=0.002, P<0.001 and P=0.009 respectively which were statistically highly significant indicating the rate pressure product increase in sufentanil group is much lesser when compared to lidocaine group both clinically as well as statistically.
DISCUSSION: Laryngoscopy and endotracheal intubation elicit a reflex cardiovascular response in the form of hypertension and tachycardia in adults. Though well tolerated in healthy adult patients it can have catastrophic consequences in patients with coronary artery disease and cerebrovascular diseases.¹

There is increased release of catecholamines norepinephrine, epinephrine and vasopressin-the result of which is tachycardia and hypertension. It also causes a rise in intracranial pressure. When blind nasal intubation is done without the use of laryngoscope the rise in catecholamine levels is not as significant compared to when nasal intubation is done with the use of laryngoscope, which indicates that laryngoscopy alone is the major cause of the reflex response and the increase in catecholamine levels.¹⁰,¹¹,¹⁵

It is very much essential to minimize the hemodynamic response to laryngoscopy and intubation in high risk patients such as patients with history of coronary artery disease, hypertension and cerebrovascular diseases. To achieve this it is important to understand the dynamic interactions between the drugs used, onset of drug effects and the delicate balance between the therapeutic effects of drugs and the effects of the noxious stimuli. One should avoid over treating these responses which are usually short lived and well tolerated by most patients—one ounce of prevention is worth a pound of cure.¹²

Various methods are employed to minimize the adverse hemodynamic responses to laryngoscopy and intubation—curtailing or reducing the duration of laryngoscopy, use of ACE inhibitors, sodium nitroprusside, lidocaine sprays and gargles, use of McCoy blade instead of Macintosh blade and use of beta blocker esmolol.¹³

ABOUMADI M.N et al studied the effects of small and large doses of intravenous lidocaine in attenuating the stress response to laryngoscopy and intubation. 30 patients aged between 28 and 35 years were included in the study. Group A served as control and Group B received 1% 0.75mg/kg intravenous lidocaine and Group C received 2% 1.5 mg/kg lidocaine 3 minutes prior to laryngoscopy and intubation. They concluded intravenous lidocaine 2% given in a dose of 1.5 mg/kg given 3 minutes prior to laryngoscopy and intubation effectively attenuated the pressor response to laryngoscopy and intubation.⁷

SPLINTER W.M in 1990 concluded that lidocaine does not attenuate the hemodynamic response to laryngoscopy and intubation. 125 children aged between 2 to 12 years belonging to ASA 1 and ASA 2 were divided into 5 groups of 25 each. One group served as control and the other 4 groups received 1.5 mg/kg lidocaine at 1, 3, 4 and 5 minutes prior to laryngoscopy respectively. Intravenous lidocaine did not attenuate the pressor response to laryngoscopy and intubation in any of the concentrations.⁹

MILLER CD et al in 1990 showed in their study that intravenous lidocaine in doses ranging from 1mg/kg to 2 mg/kg failed to attenuate the hemodynamic response to laryngoscopy and intubation.¹⁶
ZHANG HP et al in 2007 used different doses of sufentanil to attenuate the stress response to laryngoscopy and intubation. Higher doses of sufentanil caused respiratory depression in patients where surgery lasted less than one hour.17

CHANG HC et al in 2006 used small doses of sufentanil in attenuating the stress response to laryngoscopy and intubation. A dose of 0.2 µg/kg given three minutes prior to laryngoscopy attenuates the stress response satisfactorily and had less post-operative respiratory depression even when used for surgeries lasting sixty minutes or less.8 Various studies conducted by different authors have shown that sufentanil has a better hemodynamic stability during laryngoscopy and intubation as well as in the peri-operative period when compared to fentanyl and lidocaine.8, 13, 14

In our study we compared intravenous lidocaine 2% 1.5 mg/kg and intravenous sufentanil 0.2 µg/kg both given 3 minutes prior to laryngoscopy and intubation and compared them to ascertain which was superior lidocaine or sufentanil.

In our study maximum increase in heart rate occurred at 1 minute from onset of laryngoscopy in both the groups. It was 16.5% from baseline value in the lidocaine group and in sufentanil group it was 12.09% from the baseline value. At 3 and 5 minutes the heart rate response to laryngoscopy and intubation in the sufentanil group was clinically lesser compared to lidocaine group and statistically highly significant (P=0.008 and P<0.001 respectively). Around the 10th minute both groups showed a mean heart rate close to their baseline values.

Attenuation of systolic blood pressure by sufentanil group was statistically significant at 1, 3 and 5 minutes (P=0.008, P=0.002, P=0.001 respectively) compared to the lidocaine group. Sufentanil attenuates the rise in systolic blood pressure due to laryngoscopy and intubation better than lidocaine in our study. Again in our study the patients in sufentanil group showed early recovery to baseline values (at 6th minute) compared to patients in the lidocaine group (at 8th minute and P<0.001).

The percentage increase in mean diastolic blood pressure in our study at 1, 3 and 5 minute time interval was clinically less and statistically highly significant when compared to lidocaine group (P=0.001, P<0.001 and P<0.001 respectively). At 10th minute the values came down to baseline values still sufentanil group was statistically more significant compared to lidocaine group (P=0.021)

Similarly when mean arterial pressures were compared, sufentanil group showed statistically highly significant attenuation of mean arterial pressure than the lidocaine group at 1, 3, 5 and 10 minutes from the onset of laryngoscopy (P=0.001, P<0.001, P<0.001 and P=0.007 respectively). Sufentanil group showed earlier recovery to baseline values compared to lidocaine group (P<0.001).

Rate pressure product is the product of heart rate and systolic blood pressure. It is one of the best index of myocardial oxygen consumption.34 In our study rate pressure product increase in sufentanil group was much lesser compared to lidocaine group and even statistically highly significant at all time intervals with P values at 3, 5 and 10 minutes being P=0.002, P<0.001 and
P=0.009 respectively. Rate pressure product increase at 1 minute time interval in sufentanil group was lesser compared to lidocaine group both clinically as well as statistically (P=0.005).

CONCLUSION: Based on our present comparative study the following conclusions were drawn:

- Sufentanil is more effective when compared to lidocaine in attenuating the hemodynamic response to laryngoscopy and intubation.
- Sufentanil given in a dose of 0.2 µg/kg intravenously 3 minutes prior to laryngoscopy attenuates the hemodynamic stress response to laryngoscopy and intubation with no post-operative respiratory depression and other side effects of the drug.

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