

## COMPARISON OF DEXMEDETOMIDINE PROPOFOL VIRUS FENTANYL – PROPOFOL FOR CONDITIONS OF LARYNGEAL MASK AIRWAY INSERTION IN ELECTIVE SURGERIES

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**ABSTRACT: BACKGROUND:** Laryngeal Mask Airway (LMA) is a supraglottic airway device, requiring optimal conditions for insertion to minimize the hemodynamic perturbation associated with LMA insertion. The aim of our study is to compare Dexmedetomidine – Propofol (Dp) and Fentanyl – Propofol (Fp) for conditions of LMA insertion in short surgeries under general anesthesia. **AIMS AND OBJECTIVES:** To compare efficacy of Dexmedetomidine- Propofol and Fentanyl - Propofol for LMA insertion in terms of 1) Ease of insertion, 2) The Hemodynamic responses to LMA insertion. **MATERIALS AND METHODS:** Ours was a double blinded randomized comparative study having 30 patients in each group, Dp and Fp, where patients received 1µg/kg of dexmedetomidine and fentanyl respectively followed by Propofol 2.5mg/kg as per protocol. The ease of LMA insertion parameters (Jaw relaxation, Coughing or movement during insertion, number of attempts required) and hemodynamic parameters (Mean heart rate, mean Systolic BP, mean Diastolic BP, Respiratory rate, SPO2) were monitored at following time intervals: Baseline, Pre-med, Pre LMA, Post LMA (at insertion), 1 min, 2 mins, 3 mins, 5 mins, 7 mins, 10 mins. **Statistical analysis:** Statistical analysis was done by using descriptive and inferential statistics using Chi square test, Wilcoxon signed rank test and Mann Whitney U test. The software used in the analysis was SPSS 17.0 version and Graph Pad Prism 5.0 and  $p < 0.05$  is considered as level of significance. **RESULTS:** Jaw relaxation was statistically better, with less incidence of coughing in dexmedetomidine group. Hemodynamic parameters remained stable in Dexmedetomidine group whereas in fentanyl group a rise in HR and SBP was seen Post LMA insertion which stabilized quickly. Numbers of attempts of LMA insertion were comparable, with SPO2 and ETCO2 values within normal limits. **CONCLUSION:** Dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion compared to fentanyl in the given doses.

**KEYWORDS:** LMA, Dexmedetomidine, Fentanyl.

**INTRODUCTION:** Laryngeal mask airway (LMA) has become an important addition to the anesthesiologist's armamentarium for airway management.

LMA has an advantage of being less stimulating than the tracheal intubation<sup>1,2</sup> and with lesser hemodynamic response to insertion compared to that found during tracheal intubation.<sup>3,4</sup>

Though it has been shown that insertion of LMA requires lighter anesthesia than endotracheal intubation,<sup>1,5,6</sup> inadequate depth of anesthesia may provoke coughing, gagging, laryngospasm, which may lead to adverse hemodynamic changes. Therefore, optimal conditions for LMA insertion necessitate generous use of anesthetic agents for induction.

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In our study we have compared the effectiveness of combination of dexmedetomidine – propofol (Dp) and fentanyl – propofol (Fp) for conditions of LMA insertion in short surgeries under general anesthesia.

**MATERIALS AND METHODS:** The study was initiated after obtaining permission from the Institutional Ethics Committee. It was a prospective, randomized, double blind comparative study carried out in 60 patients aged between 20 and 50 years belonging to ASA I-II category with MPC grade I and II who were scheduled for short elective surgeries. Patients with asthma, respiratory or oropharyngeal tract pathology or those on anti-hypertensive drugs like  $\beta$ -blockers and calcium channel blockers, patients with risk of aspiration like full stomach, hiatus hernia, pregnancy, patients with known drug allergy were excluded from the study.

We divided patients into 2 groups: Dp (dexmedetomidine) or Fp (fentanyl) with 30 patients in each group. Randomization was done by random table method (computer generated randomization table); random sequence was generated by random allocation software. Utilizing the value of change in MBP from the study of Uzümcügil. F et al and keeping confidence interval of 95% and power of the test 80%, the sample size was calculated using Epi info software to be 60 i.e. 30 patients in each group. Observer and patients were unaware of the study drug which was prepared and administered by third person not involved in the study.

On arrival in operating room, monitoring with electrocardiogram (ECG), pulse-oximeter, non-invasive blood pressure (NIBP) was started. After securing i.v line, infusion of Ringer lactate (RL) was started at the rate of 10ml/kg. Patients were premedicated with Inj. Ranitidine 1mg/kg i.v, Inj. Ondansetron 0.1mg/kg i.v, Inj. Midazolam 0.03mg/kg i.v, and Inj. Glycopyrrolate 0.004mg/kg i.v.

After pre oxygenation for 3 minutes with 100% O<sub>2</sub> on mask, group Dp received 1 $\mu$ g/kg dexmedetomidine and group Fp received 1 $\mu$ g/kg of fentanyl diluted in 10ml normal saline respectively, i.v over 10 minutes.

Thirty seconds later, patients were induced with intravenous injection of propofol 2.5mg/kg mixed with 1 ml of 2% lignocaine.

90 sec after propofol bolus, first attempt at insertion of LMA was made. If required, further increments of propofol 0.5mg/kg i.v were given every 30 seconds till loss of consciousness and loss of eyelash reflex. After insertion, cuff was inflated with recommended volume of air, and patient connected to breathing circuit.

Patients were kept on spontaneous ventilation. If the attempt was unsuccessful, patients received additional bolus dose of propofol 0.5mg/kg i.v. Insertion was planned to be tried for a maximum of three attempts.

However, the conditions during LMA insertion were graded only during first attempt. All the LMA insertions in patients were done by single person involved in the study. Jaw was opened using scissoring technique with left hand and LMA was inserted using Classical insertion technique.

Insertion was confirmed by the appearance of End tidal CO<sub>2</sub> (EtCO<sub>2</sub>) waveform and by five point auscultation. Patients were monitored for hemodynamic responses like heart rate (HR), blood pressure (BP), respiratory rate (RR), at following time intervals: baseline, just after administering the study drug (Pre-med), immediately before LMA insertion (Pre LMA), 30 seconds after LMA insertion (Post LMA), 1min, 2mins, 3mins, 5mins, 7mins, 10mins after insertion.

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In order to monitor conditions for LMA insertion, scoring system, modified from Muzi and colleagues was used<sup>7</sup> as follows:

Fully relaxed	grade 1
Mild resistance	grade 2
Tight but opens	grade 3
Closed	grade 4
<b>JAW RELAXATION</b>	

None	grade 1
One or two coughs	grade 2
Three or more coughs	grade 3
Bucking or movements	grade 4
<b>COUGHING</b>	

In each category scores less than 2 were defined as acceptable for LMA insertion. Isoflurane was started at a dial concentration of 1 in both the groups 3 minutes after LMA insertion. For maintenance 50% N<sub>2</sub>O and Isoflurane in oxygen was used. Isoflurane concentration was adjusted to maintain hemodynamic parameters within 15% of baseline.

Bradycardia defined as heart rate less than 15% of the baseline or less than 50/min was treated with Inj. Atropine 0.01mg/kg i.v. Hypotension defined as BP less than 30% of baseline was treated with 3 mg aliquots of Inj. Mephenteramine i.v.

On completion of surgery, LMA was removed and patients were shifted to Recovery room.

**RESULTS:** We found a statistically better jaw relaxation in dexmedetomidine group compared to fentanyl group (table 3).

No patient in dexmedetomidine group had coughing but 6 patients (20%) had grade 2 of coughing and 1 patient (3.33%) had grade 4 of coughing in fentanyl group (table 4).

1 patient (3.33%) required two attempts at LMA insertion in dexmedetomidine group and 5 patients (16.67%) in fentanyl group required two attempts at LMA insertion. This difference was not statistically significant. (p value = 0.08). (table 5).

The mean heart rate showed a decreasing trend throughout the study duration in dexmedetomidine group and in fentanyl group compared to baseline. The mean heart rates were comparable between both the study groups throughout the study duration except for the Post LMA phase where the mean heart rate in fentanyl group showed statistically significant rise compared to dexmedetomidine group.(p value =0.0006). (table: 6.1)

On comparing Post LMA, 1 min, 2mins, 3 mins mean heart rate to Pre LMA mean heart rate, in dexmedetomidine group there was no statistically significant difference. (p> 0.05). In fentanyl group, on comparing Post LMA, 1 min, 2mins, 3 mins mean heart rate to Pre LMA mean heart rate, there was a statistically significant rise in mean heart rate (p value< 0.05) in Post LMA phase which quickly returned to values near to the pre LMA mean heart rate values. (table 6.2).

The SBP showed a decreasing trend in dexmedetomidine and fentanyl group compared to baseline. Comparing the Pre LMA values to baseline, there is a fall in SBP in both the groups, at

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insertion however there was a statistically significant rise in SBP in fentanyl group, as against this SBP in dexmedetomidine group showed a lower reading (no rise). After 1 min there was lowering of SBP in both the groups. (table 7.1)

A statistically significant fall ( $p$  value  $< 0.05$ ) in mean SBP was seen in the Post LMA, 1 min, 2 mins, 3mins compared to the Pre LMA mean SBP in dexmedetomidine group. In fentanyl group statistically significant rise ( $p$  value = 0.003) in mean SBP was seen in Post LMA phase compared to the Pre LMA mean SBP, followed by a non-significant change in mean SBP compared to Pre LMA mean SBP in 1min, 2 mins, 3 mins. ( $p > 0.05$ ) (table 7.2). There was no statistically significant difference ( $p$  value  $> 0.05$ ) between the mean DBP of the dexmedetomidine and fentanyl group throughout the study duration. (table 8.1 and 8.2)

There was no statistically significant difference between the respiratory rates between both the groups. (table 9)

**DISCUSSION:** Apart from adequate depth of anaesthesia, factors which affect LMA insertion are mouth opening, MPC grade of the patient, jaw relaxation and coughing. Induction of general anaesthesia and LMA insertion are associated with changes in cardiovascular variables due to both the specific effects of the anesthetic drugs administered perioperatively and the adrenergic state of the patient.

The hemodynamic response to LMA insertion is expected to manifest in form of rise in HR and BP. In order to attenuate these responses fentanyl had been used more commonly but now dexmedetomidine is being considered for attenuation of these responses. Successful attenuation of the stress response by the drug can be judged by comparing the HR, BP of the patients prior to LMA insertion and after LMA insertion. Hence we studied fentanyl and dexmedetomidine for their effects on the ease of insertion of LMA and the hemodynamic changes associated with LMA insertion

Wong CM et al<sup>8</sup> found that a standard fentanyl dose of  $1\mu\text{g}/\text{kg}$  co-administered with propofol  $2.5\text{mg}/\text{kg}$ , provided optimal conditions in only 65% of cases and reported a higher incidence of resistance to mouth opening with use of fentanyl. We have used similar doses of propofol and fentanyl and our findings are on similar lines, with only 73.33% of cases having fully relaxed jaw required for LMA insertion.

In dexmedetomidine group 96.67% patient had fully relaxed jaw. We observed a better jaw relaxation with dexmedetomidine group which is similar to that found by Hanci V et al<sup>9</sup> though they studied the drugs for endotracheal intubation without muscle relaxant.

We compared incidence of coughing between both the groups and noted higher incidence of coughing in fentanyl group. Wee. P et al<sup>10</sup> and Wong CM et al<sup>9</sup> also reported that higher doses of fentanyl were associated with a notable increase in the incidence of coughing.

Interestingly, Liang HE et al<sup>11</sup> showed that intravenous dose of dexmedetomidine ( $0.5\mu\text{g}/\text{kg}$  or  $1\mu\text{g}/\text{kg}$ ) given immediately before administration of intravenous fentanyl ( $4\mu\text{g}/\text{kg}$ ) significantly reduces the fentanyl induced cough. This may be the explanation for the lower incidence of coughing on LMA insertion in dexmedetomidine group.

There was no significant difference in number of attempts at LMA insertion. Our results are in line with results of Ali. AR et al<sup>12</sup> who found that the number of unsuccessful LMA insertion at first attempt was comparable in propofol/dexmedetomidine group (12%) versus propofol/ fentanyl group (8%), ( $p= 0.325$ ).

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It has been found that LMA insertion elicits lesser hemodynamic responses than tracheal intubation, Suparto et al<sup>13</sup> compared dexmedetomidine and fentanyl for attenuating sympathetic responses to laryngoscopy and intubation and reported that the mean heart rate was 18% higher than baseline measurements in the fentanyl group 60 seconds post intubation whereas heart rates of the patients in the dexmedetomidine group at 60 seconds post intubation returned slightly lower than baseline values.

We also observed an increase in heart rate 60 seconds post extubation in fentanyl group. Our findings are also in line with those found by Sukhminder et al<sup>14</sup>, though our findings are for LMA insertion and not for intubation. They found a significant rise of mean HR in group F as compared with group D at intubation ( $P < 0.001$ ). Our findings for heart rate changes are similar to the study by Uzümcügil. F et al<sup>15</sup> except that we have found a significant rise in post LMA mean HR in fentanyl group.

In our study, in fentanyl group we found a significant rise in SBP in the Post LMA phase which was not seen in dexmedetomidine group, though in study by Uzumcugil F et al<sup>15</sup> they found no difference in SBP between dexmedetomidine and fentanyl. Suparto et al<sup>13</sup> found that SBP increased by 40% in the fentanyl group compared to 25%-28% in the dexmedetomidine group. As against the results of this study, there was no rise in blood pressure in dexmedetomidine group in our study. The difference may be due the fact that they studied the drugs for laryngoscopy and intubation.

We found no statistically significant difference in the RR between both the groups. Lawrence and colleagues<sup>16</sup> studied effects of 2µg/kg dexmedetomidine and reported no change in respiratory rate. Uzumcugil. F et al<sup>15</sup> and Hsu and colleagues<sup>17</sup> found an increase in RR with dexmedetomidine which we also found but the rise was statistically insignificant.

**CONCLUSION:** From our study we came to a conclusion that dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion compared to fentanyl in the given doses and that dexmedetomidine can be used with an advantage for LMA insertions in short surgical procedures.

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	Dexmed Group	Fentanyl Group	p-value
<b>Age (yrs)</b>			
21-30 yrs	14(46.67%)	11(36.67%)	0.61 p-value=0.73 NS, p>0.05
31-40 yrs	6(20%)	7(23.33%)	
41-50 yrs	10(33.33%)	12(40%)	
Mean ± SD	33.76±10.99	37.13±12.17	
<b>Gender</b>			
Male	15(50%)	11(36.67%)	1.08 p-value=0.29 NS, p>0.05
Female	15(50%)	19(63.33%)	
Weight (kg)	49.90±7.82	50.70±11.07	p-value=0.74 NS, p>0.05

**TABLE 1: BASELINE CHARACTERISTICS OF PATIENTS**

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	Dexmed Group	Fentanyl Group	p-value
Mouth Opening			
2 to ≤ 3Fingers	3(10%)	4(13.33%)	0.16 p-value=0.68 NS, p>0.05
>3 Fingers	27(90%)	26(86.67%)	
Mean ± SD	2.95±0.15	2.93±0.17	
MPC Grading			
I	21(70%)	20(66.67%)	0.07 p-value=0.78 NS, p>0.05
II	9(30%)	10(33.33%)	
ASA Grading			
I	24(80%)	26(86.67%)	0.48 p-value=0.48 NS, p>0.05
II	6(20%)	4(13.33%)	

**TABLE 2: BASELINE CHARACTERISTICS FOR MOUTH OPENING, MPC GRADING AND ASA GRADING**

Jaw Relaxation	Dexmed Group	Fentanyl Group	p-value
Grade 1	29(96.67%)	22(73.33%)	6.53 p-value=0.032 S, p<0.05
Grade 2	1(3.33%)	6(20%)	
Grade 3	0(0%)	2(6.67%)	
Grade 4	0(0%)	0(0%)	
<b>Total</b>	<b>30(100%)</b>	<b>30(100%)</b>	

**TABLE 3: COMPARISON OF JAW RELAXATION IN BOTH THE STUDY GROUPS**

Coughing or movements	Dexmed Group	Fentanyl Group	p-value
Grade 1	30(100%)	23(76.67%)	7.92 p-value=0.010 S, p<0.05
Grade 2	0(0%)	6(20%)	
Grade 3	0(0%)	0(0%)	
Grade 4	0(0%)	1(3.33%)	
<b>Total</b>	<b>30(100%)</b>	<b>30(100%)</b>	

**TABLE 4: COMPARISON OF COUGHING OR MOVEMENTS IN BOTH THE STUDY GROUPS**

Number of attempts	Dexmed Group	Fentanyl Group	p-value
One	29(96.67%)	25(83.33%)	2.96 p-value=0.08 NS, p>0.05
Two	1(3.33%)	5(16.67%)	
Three	0(0%)	0(0%)	
<b>Total</b>	<b>30(100%)</b>	<b>30(100%)</b>	

**TABLE 5: COMPARISON OF NUMBER OF ATTEMPTS IN BOTH THE STUDY GROUPS**

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Time	Dexmed Group		Fentanyl Group		z-value	p-value
	Mean	SD	Mean	SD		
Baseline	87.06	13.31	89.16	13.55	-0.6	0.547 NS, P>0.05
Premed	84.03	12.52	85.40	15.26	-0.38	0.70 NS, P>0.05
Pre LMA	74.2	13.38	80.70	17.01	-1.64	0.10 NS, P>0.05
Post LMA	76	14.99	90.70	16.24	-3.64	0.0006 S, p<0.05
1 min	75.8	13.90	82.50	15.87	-1.75	0.08 NS, P>0.05
2 min	76	14.31	81.06	15.03	-1.33	0.18 NS, P>0.05
3 min	75.46	12.97	80.03	15.08	-1.25	0.21 NS, P>0.05
5 min	77.03	13.59	79.70	14.93	-0.72	0.47 NS, P>0.05
7 min	75.83	12.48	77.33	12.88	-0.45	0.64 NS, P>0.05
10 min	78.23	13.32	79.03	14.46	-0.22	0.82 NS, P>0.05

**TABLE 6.1: COMPARISON OF MEAN HEART RATE IN BOTH THE STUDY GROUPS**

Time	Dexmed Group				Fentanyl Group			
	Mean	SD	z- value	p-value	Mean	SD	z-value	p-value
Pre LMA	74.20	13.38	-		80.70	17.01		
Post LMA	76.00	14.99	1.45	0.158 NS, p>0.05	90.70	16.24	7.531	0.000 S, p <0.05
1 min	75.80	13.90	1.32	0.197 NS, p>0.05	82.5	15.87	0.900	0.376 NS, P>0.05
2 min	76.00	14.31	1.27	0.211 NS, p>0.05	81.06	15.03	0.193	0.848 NS, P>0.05
3 min	75.46	12.97	0.93	0.356 NS, p>0.05	80.03	15.08	0.310	0.758 NS, P>0.05

**TABLE 6.2: COMPARISON OF PRE-LMA MEAN HEART RATE TO POST LMA, 1 MIN, 2 MINS 3 MINS MEAN HEART RATE IN BOTH THE STUDY GROUPS**

Time	Dexmed Group		Fentanyl Group		z-value	p-value
	Mean	SD	Mean	SD		
Baseline	123.86	13.24	122.26	17.43	0.400	0.691 NS, p>0.05
Premed	125.63	14.55	126.1	16.77	0.115	0.909 NS, p>0.05
Pre LMA	119	14.60	115.83	19.08	0.722	0.474 NS, p>0.05
Post LMA	114.43	13.78	124.33	22.12	2.080	0.043 S, p<0.05
1 min	113.53	13.31	117.03	19.65	0.808	0.423 NS, p>0.05
2 min	110.83	11.86	111.8	16.13	0.264	0.793 NS, p>0.05
3 min	107.66	11.16	110.33	13.27	0.842	0.403 NS, p>0.05
5 min	107.66	11.16	108.56	12.84	0.290	0.773 NS, p>0.05
7 min	103.53	8.72	107.13	14.26	1.179	0.244 NS, p>0.05
10 min	103.9	10.06	107.76	13.17	1.277	0.207 NS, p>0.05

**TABLE 7.1: COMPARISON OF MEAN SBP IN BOTH THE STUDY GROUPS**



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Time	Dexmed Group				Fentanyl Group			
	Mean	SD	z-value	p-value	Mean	SD	z-value	p-value
Pre LMA	119	14.60			115.83	19.08		-
Post LMA	114.43	13.78	2.99	0.006 S, p<0.05	124.33	22.12	3.28	0.003 S, p<0.05
1 min	113.53	13.31	3.35	0.002 S, p<0.05	117.03	19.65	0.33	0.742 NS, p>0.05
2 min	110.83	11.86	4.73	0.000 S, p<0.05	111.8	16.13	1.23	0.228 NS, p>0.05
3 min	107.66	11.16	5.55	0.000 S, p<0.05	110.33	13.27	1.92	0.064 NS, p>0.05

**TABLE 7.2: COMPARISON OF PRE-LMA MEAN SBP TO POST LMA, 1 MIN, 2MINS, 3 MINS MEAN SBP IN BOTH THE STUDY GROUPS**

Time	Dexmed Group		Fentanyl Group		z-value	p-value
	Mean	SD	Mean	SD		
Baseline	76.6	8.09	76.9	13.89	0.102	0.919 NS, p>0.05
Premed	78.8	9.61	78.8	14.87	0.000	1.000 NS, p>0.05
Pre LMA	72.86	13.37	72.6	15.27	0.072	0.943 NS, p>0.05
Post LMA	69.4	12.03	74.56	16.79	1.370	0.177 NS, p>0.05
1 min	67.46	10.42	70.5	16.31	0.858	0.395 NS, p>0.05
2 min	65.6	8.76	68.33	15.74	0.831	0.411 NS, p>0.05
3 min	65.43	7.55	66.86	13.69	0.502	0.618 NS, p>0.05
5 min	62.1	10.57	65.36	12.59	1.088	0.281 NS, p>0.05
7 min	61.73	8.388	65.53	14.47	1.244	0.220 NS, p>0.05
10 min	62.06	8.92	66	13.50	1.331	0.189NS, p>0.05

**TABLE 8.1: COMPARISON OF MEAN DBP IN BOTH THE STUDY GROUPS**

Time	Dexmed Group				Fentanyl Group			
	Mean	SD	z-value	p-value	Mean	SD	z-value	p-value
Pre LMA	72.86	13.37	-	-	72.60	15.27	--	-
Post LMA	69.40	12.03	2.157	0.039 S, p<0.05	74.56	16.79	0.782	0.441 NS, p>0.05
1 min	67.46	10.42	3.111	0.004 S, p<0.05	70.50	16.31	0.891	0.380 NS, p>0.05
2 min	65.60	8.76	4.223	0.000 S, p<0.05	68.33	15.74	1.692	0.101 NS, p>0.05
3 min	65.43	7.55	3.657	0.001 S, p<0.05	66.86	13.69	2.348	0.026 S, p<0.05

**TABLE 8.2: COMPARISON OF PRE-LMA MEAN DBP TOPOST LMA, 1 MIN, 2MINS, 3 MINS MEAN DBP IN BOTH THE STUDY GROUPS**

Time	Dexmed Group		Fentanyl Group		z-value	p-value
	Mean	SD	Mean	SD		
Baseline	18.93	2.81	18.46	2.73	0.651	0.518 NS, p>0.05
Premed	18.93	2.94	18.63	2.98	0.392	0.697 NS, p>0.05
Pre LMA	18.90	2.85	18.43	2.90	0.627	0.533 NS, p>0.05
Post LMA	19.06	2.83	18.73	2.75	0.462	0.646 NS, p>0.05
1 min	19.16	3.24	18.50	2.70	0.864	0.391 NS, p>0.05
2 min	19.06	2.81	18.66	2.72	0.560	0.578 NS, p>0.05
3 min	18.90	3.07	18.43	2.66	0.628	0.532 NS, p>0.05
5 min	19.00	2.90	18.70	2.73	0.412	0.682 NS, p>0.05
7 min	18.90	2.84	18.70	2.66	0.281	0.780 NS, p>0.05
10 min	19.00	2.75	18.60	2.83	0.554	0.582 NS, p>0.05

TABLE 9: COMPARISON OF MEAN RR IN BOTH THE GROUPS

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