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Haemodynamic Effects of LMA Fastrach versus Macintosh Laryngoscope While Intubation in Patients Undergoing Cabg

Vanita[1], Renuka R.[2]

[1]Senior Resident, Sanjay Gandhi Memorial Hospital, Mangolpuri, Delhi, 110083, India. [2]Assistant Professor, Department of Anaesthesiology, Sapthagiri Institute of Medical Sciences & Research Centre, Bangalore, Karnataka 560090, India.

Abstract

Coronary artery bypass grafting (CABG) surgery is still the predominant operative procedure for myocardial revascularization. The pressor response to intubation is a detrimental factor in these patients, where stable hemodynamics is desired. Use of various intubation aids, is one of the methods by which this could be minimised. Hence, we decided to compare the haemodynamic changes to endotracheal intubation after conventional laryngoscopy versus the use of intubating laryngeal mask airway. We also aimed at comparing the ease of intubation and the complications of the above two intubation methods. *Methods:* Prospective, randomized, double blinded study in 60 patients between 30-75 yrs age group of either gender, scheduled for elective CABG surgery. patients were evaluated preoperatively and were randomly allocated into group I & group II consisting of 30 patients each using computer generated numbers. General anaesthesia administered and for patients in group I ILMA was used and in group II conventional laryngoscopy and endotracheal intubation was done. Haemodynamic parameters (blood pressure, heart rate, ST segment analysis) were recorded at different time intervals and the occurrence of adverse events such as oxygen desaturation and soft tissue trauma was also noted. *Results:* The time taken for intubation (represented as Mean SD) was found to be 108.5 (± 36.8) seconds in group I, 22.5 (±11.7) seconds in group II with a p value of 0.0001. There was no statistically significant changes in the haemodynamic parameters (heart rate, blood pressure, ST segment changes) between both the groups. However, statistically significant intragroup comparisons were found. The incidence of intraoperative complications was found to be 6.6% in group I and 3.3% in group II. Thus we concluded that, intubation through intubating laryngeal mask airway takes more time than conventional laryngoscopy and endotracheal intubation but offers no advantage when stress response to intubation is concerned in patients undergoing CABG.

Keywords: Coronary Artery Bypass Grafting; Intubating Laryngeal Mask Airway; Macintosh Laryngoscope Blade; Pressor Response; Wilcoxon Ranksum Test.

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Introduction

Modern day anaesthesia by virtue of its newer technology has indeed made the human body hemodynamically stable under anaesthesia. However, the pressor response to intubation is still a considerable worry to the anaesthesiologist. This response has been recognised since 1951 [1,2]. There are many methods of attenuating this response and the appropriate methods have to be chosen [3-11]. Coronary artery bypass grafting (CABG) surgery is still the predominant operative procedure for myocardial revascularisation [12]. Hemodynamic alterations such as hypotension after induction or hypertension at intubation are not infrequent.

Corresponding Author: Renuka R., Assistant Professor, Department of Anaesthesiology, Sapthagiri Institute of Medical Sciences & Research Centre, Bangalore.
E-mail: drmadhumitha9@rediffmail.com
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There are many methods of attenuating this response including drugs (lignocaine, beta blockers, high dose opioids etc.) and alternative methods of intubating the trachea [3-11]. Laryngoscopy and intubation is the primemeans to secure the airway. However, endotracheal intubation stimulates the sympathoadrenal system and this is associated with cardiovascular responses in the form of hypertension, tachycardia and dysarrythmias [1,13,14] and these responses are detrimental in these patients. These may culminate into left ventricular failure or myocardial ischemia in the presence of coronary or cerebral atheroma or hypertension which may become life threatening [14].

Intubating laryngeal mask airway (ILMA) is a supraglottic airway device which sits outside the trachea and provides a hands free means of achieving a gas tight airway [17]. The features of ILMA allow optimal alignment of the mask aperture with the glottic opening and provides a conduit for endotracheal tube passage [18]. The cardiovascular response of inserting ILMA was shown to be minimal in coronary artery surgery patients compared to endotracheal intubation [3]. However, there are studies which show that the cardiovascular response to intubation are similar in ILMA & endotracheal intubation [19,20]. Therefore we undertook this study, to compare the haemodynamic changes to endotracheal intubation after conventional laryngoscopy versus the use of intubating laryngeal mask airway . We also aimed at comparing the ease of intubation and the side effects between the above two intubation methods.

Materials & Methods

The study was a prospective, randomized, double-blinded clinical trial conducted after obtaining institutional ethical committee approval in 60 patients of either gender, between 30-75 years age group scheduled for elective CABG surgery. Randomization was done by computer generated random numbers. Patients with chronic obstructive pulmonary disease, uncontrolled hypertension , ASA physical status IV, VI, ejection fraction < 40%, patients with anticipated difficult airway and those with risk of aspiration of gastric contents were all excluded from the study. Patients requiring inotropic support at the time of induction were also excluded from the study.

All the patients considered for study were evaluated preoperatively and those who were taking anti hypertensive medications were continued until the morning of surgery except angiotensin converting enzyme inhibitors. intramuscular injection morphine 0.2 mg/ kg was given 30 minutes prior to surgery as premedication. Patients were randomly allocated into group I & group II consisting of 30 patients each using computer generated numbers. For patients belonging to group I - ILMA was used, the size of the device was chosen based on the weight of the patient. For patients in group II- macintosh laryngoscope was used for airway visualization and intubation done with oral endotracheal tube of internal diameter (ID) 8.5mm for male patients & 7.5mm for female patients. The study had a cross over design i.e. in the event of failure of one study method, defined by three unsuccessful attempts with the associated manouvre the alternative study method was performed. Alternative means for ensuring patient oxygenation i.e. oropharyngeal airway device was available. All the patients in the study were preoxygenated with 100% O_2. Anaesthesia was induced with intravenous administration of fentanyl (6 mcg/kg) , propofol (1 mg/kg) and non depolarizing muscle relaxant pancuronium (0.15 mg/kg) to secure the airway. In both the groups, correct positioning of the endotracheal tube was confirmed by end tidal carbon-dioxide & bilateral lung auscultation . Intraoperative monitoring consisted of invasive blood pressure, oxygen saturation, endtidal carbon dioxide, ST segment analysis for evidence of ischaemia, heart rate and rhythm analysis. The data was collected by an attending anaesthesiologist & an assistant using a data collection form on which the following were recorded:

- Success/ failure of the study method.
- Number of attempts.
- Duration of successful attempt (interval between the time of insertion of device to the detection of end tidal carbon-dioxide on capnography).
- Hemodynamic measurements.
- Adverse events such as oxygen desaturation (oxygen saturation < 90%), soft tissue trauma with bleeding, bronchospasm were recorded.

Intraoperatively haemodynamic parameters (SBP, DBP, MAP, HR, SpO_2 & ST segment -II & V_5) were recorded at different time intervals as follows:

T0 - before induction of anaesthesia (baseline)

T1 - 3 minutes after administering NDMR

T2 - at the completion of ILMA insertion (in

group I) or laryngoscopy (in group II)

T3 - 1 minute after the insertion of endotracheal tube

T4 - 5 minutes after the insertion of endotracheal tube

T5- 10 minutes after the insertion of endotracheal tube

T6 - 15 minutes after the insertion of endotracheal tube

Results

A Comparative study consisting of 60 patients , with 30 patients each in group I and group II. Both the groups were comparable in terms of age, gender, weight distribution, height distribution and BMI as seen in Table 1.

The time taken for intubation (represented as Mean ± SD) was compared in both the groups and it was found to be 108.5 (± 36.8) seconds in group I , 22.5 (± 11.7) seconds in group II with a p value of 0.0001 as seen in table 2 .

The mean heart rate varied from 70.9 (± 17) to 81.8 (± 18.9) in group I and 70.9(± 13.6) to 81.9 (± 18.8) in group II. As seen in graph 1, the heart changes in both the groups followed the same pattern and statistically they were not significant. However, while comparing within the groups the heart rate changes were significant at completion of intubation procedure (T 2) and 1 minute after the insertion of endotracheal tube (T3) in both the groups when compared to the baseline. Thus, intra group comparisons were found to be significant.

The systolic blood pressure varied from 133.1 (± 17.2) to 102.4 (± 17) , diastolic BP varied from 70.3 (± 9.8) to 59.3 (± 10) and mean arterial pressure varied from 93.9 (± 10) to 73.8 (± 11.1) in group I . Whereas in group II , the systolic blood pressure varied from140.2 (±22.4) to 108.1 (±17.9) , diastolic blood pressure varied from 72.1 (± 11) to 60.9 (± 9.4) and mean arterial pressure varied from 96.9 (±14.2) to 79.4 (± 13.2) . As seen in graph 2, 3 and 4 the blood pressure (SBP, DBP, MAP) changes in both the groups followed the same pattern. And when comparing in between the two groups it was found to be statistically insignificant. However while comparing within the groups, the changes were significant at all points except at 1 minute after insertion of endotracheal tube (T3) in both the groups when compared to the baseline. Thus, intra group comparisons were found to be significant.

As seen in graph 5, the graphs of both the groups followed the same pattern and statistically they were not significant which means that the SpO_2 changes between both the groups were similar.

Table 1: Patient characteristics

Parameter	Group I (n=30)	Group II (n=30)	p value
Sex	25:5 (M:F)	23:7 (M:F)	0.519
Age	57 (8.7)	55.9 (6.7)	0.5965
Weight	62.9 (11.1)	61.2 (9.4)	0.5261
Height	164.5 (8.8)	165.5 (7.8)	0.6539
BMI	23.1 (2.8)	22.3 (2.9)	0.2795

All data represented asMean± SD and *p value < 0.05 was considered as significant

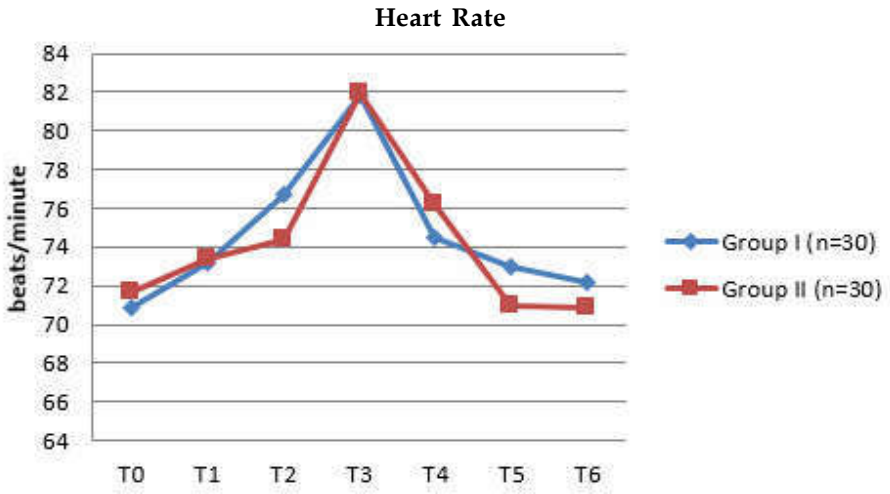
Table 2: Comparison of intubation time (in seconds)

Parameter	Group I (n=30)	Group II (n=30)	p value
Time for intubation	108.5 (36.8)	22.5 (11.7)	*<0.0001

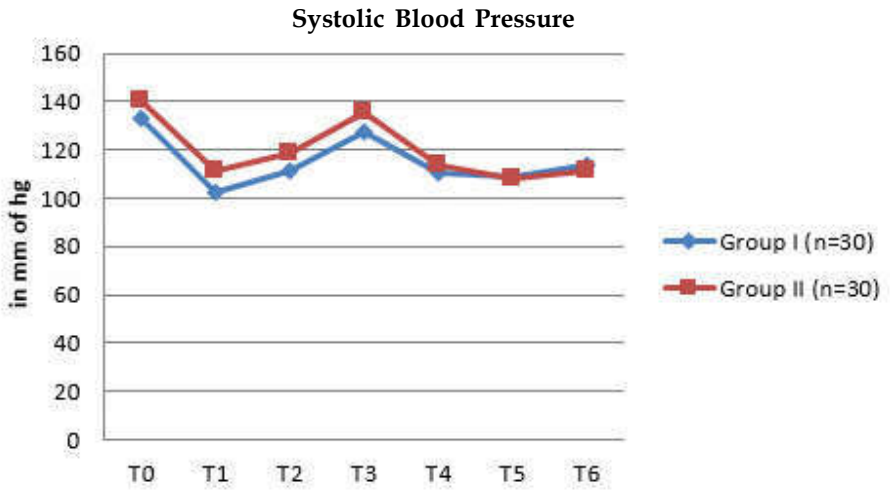
All data represented as Mean ± SD and *P value of <0.05 is considered significant

Table 3: Complications

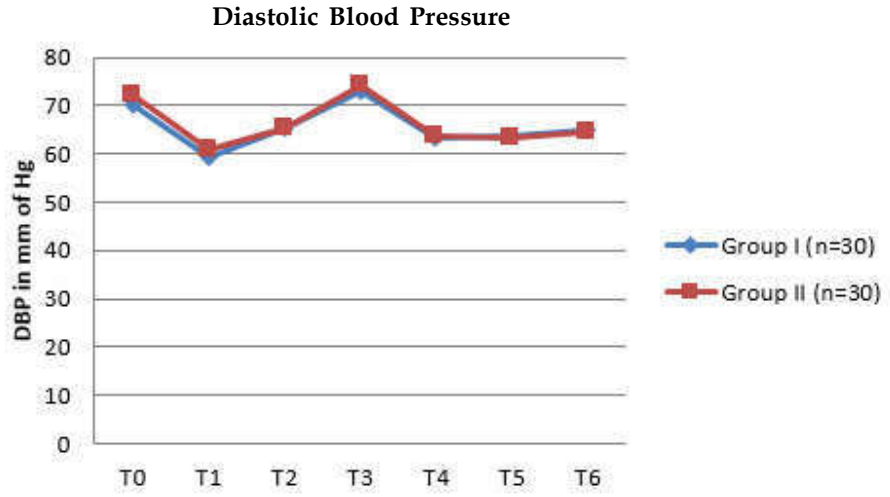
Parameter	Group I (n=30)	Group II (n=30)
Desaturation	0	0
Bronchospasm	0	1
Soft tissue trauma	1	0
Oropharyngeal bleed	1	0



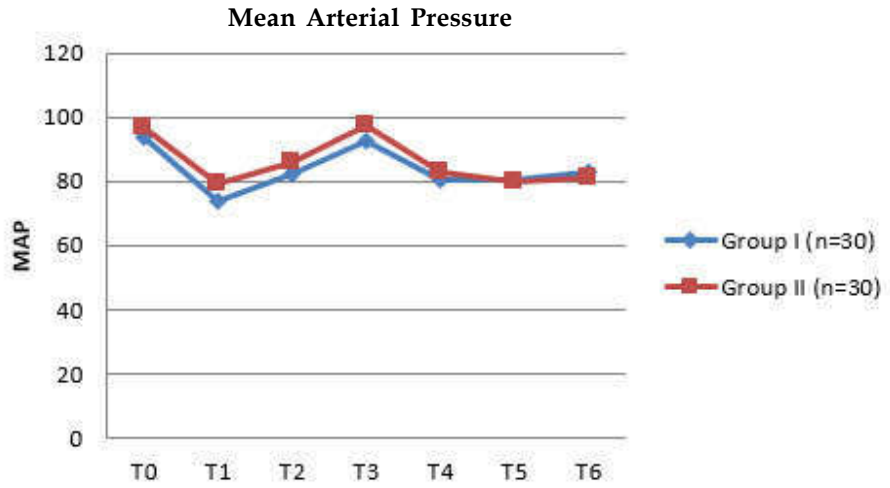
Graph 1:



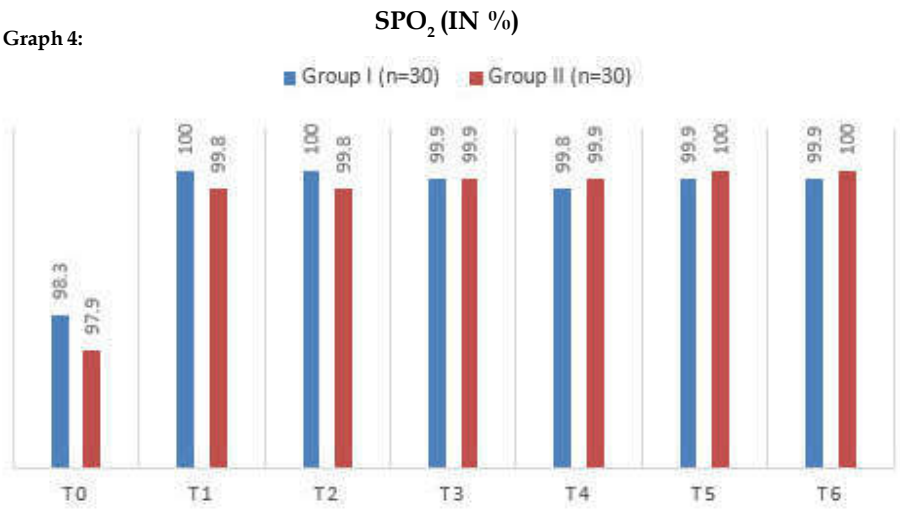
Graph 2:



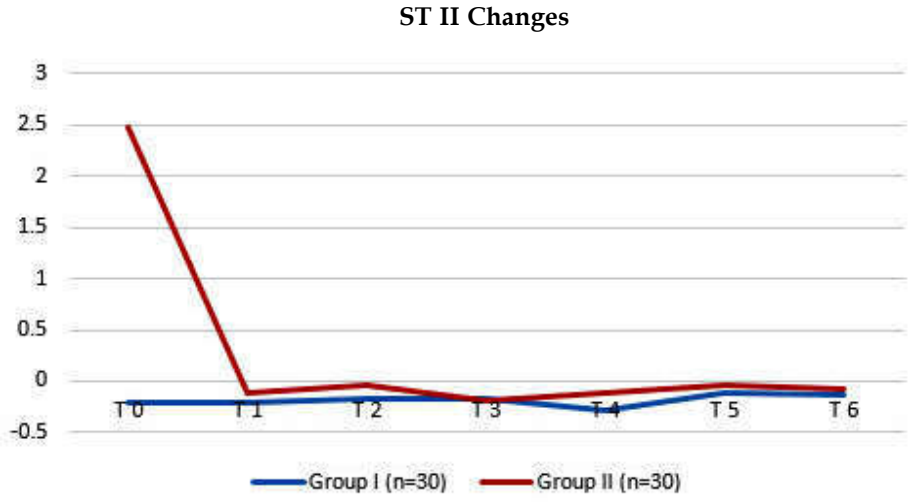
Graph 3 :



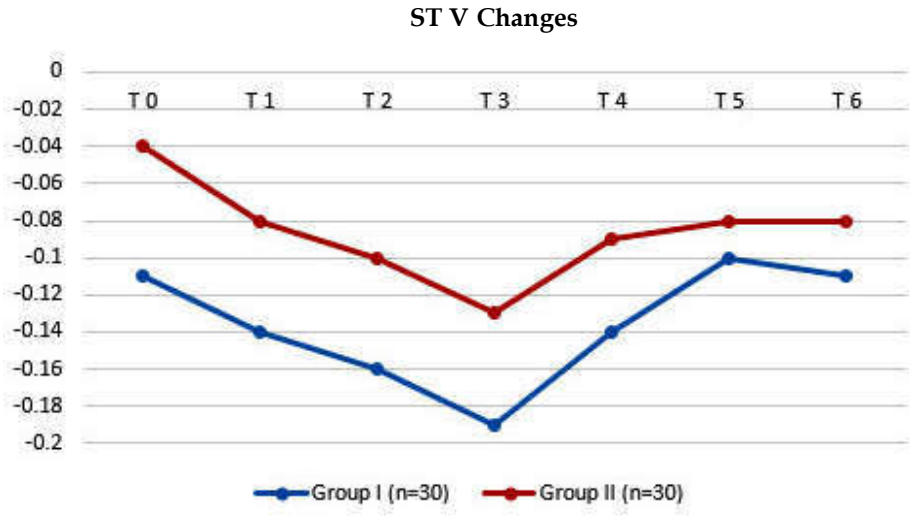
Graph 4:



Graph 5:



Graph 6:



Graph 7:

However while comparing within the groups, the changes were again insignificant.

As seen in graph 6, ST II changes between both the groups were similar. However, while comparing within the groups, the changes were significant at 3 minutes after NDMR in group II and no significant changes noted in group I as compared to the baseline. Thus, intra group comparisons were significant for group II but not for group I.

As seen in graph 7, ST V changes between both the groups were similar. And, intra group comparison was also found to be insignificant.

The patients in both the groups were observed for the occurrence of any complications in the intraoperative period. As seen in table 3, there was no evidence of desaturation (SpO_2 < 90%) in both the groups. One patient (3.3%) in group II had bronchospasm and 2 patients (6.6%) in group I had soft tissue trauma.

Statistical Analysis

Descriptive statistical analysis has been carried out in our study. Results on continuous measurements are presented as Mean± SD (Min-Max) and results on categorical measurements are presented as Numbers (%). Significance is assessed at 5% level of significance. Nonparametric variables were analysed between the two groups using the chi square test. Continuous data was analysed using mann whitney U test/ t test as applicable. The time for intubation between groups was analysed using wilcoxon ranksum test. The remaining parameters were evaluated using t-test for inter group comparisons & repeated measure ANOVA for intra group comparisons. P value of less than or equal to 0.05 was considered clinically significant. The statistical software namely SPSS version 17.0 was used for the analysis of the data and microsoft word and excel have been used to generate graphs, tables etc.

Discussion

The pressor response to intubation is a detrimental factor in patients with ischemic heart disease undergoing CABG surgery, where stable hemodynamics is desired. Use of various intubation aids, is one of the methods by which this pressor response could be minimised. Hence , we decided to compare ILMA with endotracheal intubation after laryngoscopy using macintosh blade as limited literature was available between the two in CABG surgery.

In our study we observed that, there was significant difference between the intubation time between the two groups with ILMA taking more time (108.5±36.8s) than conventional laryngoscopy and intubation (22.5±11.7s) with p value of <0.0001. This was also in accordance with the findings of the previous studies [20,22].

Studies had conflicting results when it comes to inter group comparisons of hemodynamics between the two intubation aids. Some of the studies which had given contradictory results to ours finally

concluded by saying that though ILMA has a better hemodynamic profile, yet the results are of marginal clinical significance [21]. Kahl M and colleagues [3] calculated the pressure rate product obtained by multiplying MAP and heart rate, which was found to be statistically significant i.e. intubation through ILMA showed stable hemodynamics. In our study, the intra group haemodynamic response to intubation suggested by increase in blood pressure and heart rate was significant ($p < 0.0001$) in both the groups. However, there was no significant difference in haemodynamic parameters in between the groups. This result is thus in contradiction to that of Kahl M etal. This was possibly because of the fact that their sample size was more and also probably due to the different demographic profile of their study group. In addition, they have calculated blood catecholamine concentrations which we could not do as this was not possible in our set up. Also the fact that we used same dose of fentanyl in all our patients and that all our patients were beta blocked, makes these factors equally distributed in both the groups. Yet we went on to test our hypothesis as these agents have been mentioned to attenuate the pressor response and not abolish it.

However, the literature also has studies which support our findings pertaining to the hemodynamics [17-21]. To name a few, Choyce et al. [17] found that the pressor response was of a similar magnitude in both ILMA and macintosh laryngoscope groups and also the fact that though the delayed removal of ILMA was associated with a second pressor response but this was not of any clinical significance. Kihara S et al. [20] also found no significant difference between the two groups in normotensive patients. In their study, ILMA reduced the pressor response to intubation only in hypertensive patients. According to the authors, hypertensives have an exaggerated pressor response [23,24] probably due to increased sensitivity of peripheral vessels to catecholamines [25] and also due to increased level of catecholamines [26]. Whereas in our study, controlled hypertensive patients were considered which may have led to the similar hemodynamics in both groups .

Pertaining to our findings on complications, SpO_2 changes were significant within both the groups ($p= 0.001$ for ILMA group & $p= 0.04$ for macintosh group), ST segment changes were insignificant within both the groups except for ST II change in macintosh laryngoscopy group ($p= 0.031$). One patient in macintosh laryngoscopy group had bronchospasm and in the ILMA group, one patient had lip trauma and one had oropharyngeal bleed. Hence , the occurrence of complications in both the groups were comparable. Though ,the results of evaluation of haemodynamic response to two different intubation aids used in our study varied from other studies, the result of ease of intubation and complications of the techniques was found to be similar to other studies .

Thus, we concluded that

1. There was significant difference between the time for intubation between the two groups with intubation through ILMA taking more time (108.5±36.8s) than conventional laryngoscopy and endotracheal intubation (22.5±11.7s) with a p value of <0.0001 .
2. ILMA offers no advantage in comparison to the conventional macintosh laryngoscope when stress response to intubation is concerned in patients undergoing CABG.

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