HEMODYNAMIC RESPONSE TO TRACHEAL INTUBATION VIA DIRECT LARYNGOSCOPY AND INTUBATING LARYNGEAL MASK AIRWAY (ILMA) IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT (CABG)

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Abstract

Background: A marked stress response including hypertension, tachycardia, arrhythmias and an increase in intracranial pressure often follows direct laryngoscopy. This response can be harmful specially in patients with underlying cardiac disease. The intubating laryngeal mask airway (ILMA) -a new modified laryngeal mask airway- has been introduced that facilitates tracheal intubation without using laryngoscopy. Oropharyngeal stimulation-proposed as the probable cause of stress response- have been shown to be attenuated in ILMA. We conducted this study to evaluate the stress response following two techniques in patients undergoing coronary artery surgery which are most likely to benefit from decreased hemodynamic changes during intubation.

Methods: In this trial, eighty patients, forty in ILMA group and forty in DL group were involved. To determine hemodynamic response during these manipulations, blood pressure (BP) and heart rate (HR) were recorded before and after anesthetic induction (one minute before and one, two and five minutes after successful intubation via either method).

Results: A significant increase in heart rate and blood pressure was detected in both groups after intubation. Despite existence of noted changes in both groups; quantity of these changes was similar in both groups, however quality of changes was not completely similar.

Conclusion: Finally we could hardly ascertain if intubation with ILMA is a prefered method in patients with high cardiac risk or not. But it seems that ILMA does not have much greater benefit over conventional DL in patients undergoing coronary artery by-pass grafting.

Keywords: hemodynamic stress response, intubating laryngeal mask airway (ILMA), coronary artery by-pass grafting (CABG), intubation.

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Introduction

A marked stress response including hypertension, tachycardia, arrhythmias[1] and an increase in intracranial pressure[2] often follows direct laryngoscopy[3]. Although these alterations are short lived, they might result in adverse cardiovascular events[4] in patients with[5] or even without[6] underlying cardiovascular disease. This response can be harmful specially in former group. It has been suggested that laryngoscopic stimulation of oropharyngolaryngeal structures and distension of the supraglottic tissues may have important role in this hemodynamic stress response[7,8].

The intubating laryngeal mask airway (ILMA)-a new modified laryngeal mask airway[9,10] has been introduced that facilitates tracheal intubation without resorting to laryngoscopy. As stimulation of oropharyngolaryngeal structures and distension of the supraglottic tissue would be less in this method, similar hemodynamic response should be attenuated in comparison with previous method[11,12]. This probable attenuation can be beneficial especially in patients with underlying cardiovascular and cerebral disease.

Previous studies comparing the hemodynamic stress responses of endotracheal intubation via an ILMA or after direct laryngoscopy have showed conflicting results[9,13] we aimed to conduct this study to evaluate the stress response following two techniques in patients undergoing coronary artery by-pass grafting (CABG), which are most likely to benefit from decreased hemodynamic changes during intubation.

Material and methods

Eighty patients undergoing elective CABG and requiring tracheal intubation were enrolled into this prospective, randomized clinical trial. Approval was obtained from ethics committee in Shiraz University of Medical Sciences and patients filled written informed consent before entering the study. The study was conducted according Helsinki Declaration. Only patients aged between forty and sixty with ASA classification of II or III and an ejection fraction above forty five percent were included. Patients having history of cerebrovascular disease, hypo or hyper parathyroidism, chronic obstructive pulmonary disease(COPD), gastro esophageal reflux, kidney or liver end stage disease, uncontrolled hypertension, surgery in past six months and possibility of difficult intubation or need for trans esophageal echocardiography (TEE) were excluded. Finally, selected patients were randomly allocated for tracheal intubation via the ILMA or conventional laryngoscopy. For randomization, index cards were used.

After arrival of subjects in the anesthetic room, an intravenous catheter was placed before induction of anesthesia and patients were premedicated with midazolam (40μ/kg), sufentanil (0.3 μ/kg) and morphine (0.15 mg/kg),then anesthesia was induced using thiopental (5 mg/kg) and cisatracorium (0.12 mg/kg). Orotracheal intubation started after a 5-minute period of oxygenation via mask. All intubations were performed by a single exprienced anesthetist.

Conventional laryngoscopy was performed using a Macintosh laryngoscope and PVC Murphy-type cuffed tracheal tube (Hudson respiratory Care Inc., USA). For performing ILMA, an ILM airway of approriate size (Laryngeal mask Co. Ltd, UK) was inserted using one-handed rotational movement in the sagittal plane with the patient's head supported by a pillow- to achieve a neutral position-.Then cuff was inflated with air til intracuff pressure reach 46mmHg.When adequate ventilation was confirmed, a specially designed straight silicone tube (Accusil Inc., USA) was inserted and gently advanced beyond the epiglottic elevator bar. Tracheal tubes with internal diameter of 7.5 mm and 7.0 mm were used for male and female, respectively. If any resistance was encountered during procedure, a predetermined sequence of adjusting maneuvers was performed as recommended previously. But If no resistance was felt through downward movement of the tracheal tube up to 7 cm beyond the epiglottic elevator bar, the cuff was inflated. ILMA was removed after confirmation of correct position of the endotracheal tube using bag ventilation and capnography.

To determine hemodynamic response during these manipulations, blood pressure (BP) and heart rate(HR) were recorded using a multifunction monitor (Datex-Ohmeda F-CU8, Datex Instrumentarium, finland) before and after anesthetic induction (one minute before and one, two and five minutes after successful intubation via either method).

Results

As mentioned, in our study, eighty patients, forty in ILMA group and forty in DL group were involved. To determine hemodynamic response during these manipulations, blood pressure (BP) and heart rate (HR) were recorded before and after anesthetic induction (one minute before and one, two and five minutes after successful intubation via either method).

Intubations via DL (direct laryngoscopy) was performed on first attempt while Intubation with ILMA was performed on the first (n = 31), second (n = 6) or third (n = 3) attempts until performing successful intubation. Also duration of procedure was longer in the ILMA group (91.8 ± 8.6 seconds) than in the DL group (28.5 ± 9.8 seconds).

The data on hemodynamic changes during intubation are shown in Fig. 1-4.

Fig. 1
Heart rate (HR) changes during intubation via direct laryngoscopy and intubating laryngeal mask airway

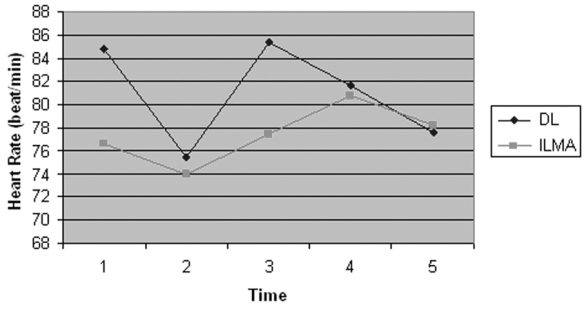

Fig. 2
Systolic blood pressure changes during intubaton with direct laryngoscopy (DL) and intubating laryngeal mask (ILMA)

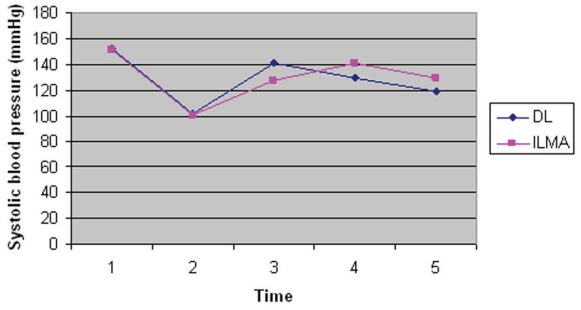

Fig. 3
Diastolic blood pressure changes during intubation with direct laryngoscopy (DL) and intubating laryngeal mask airway (ILMA)

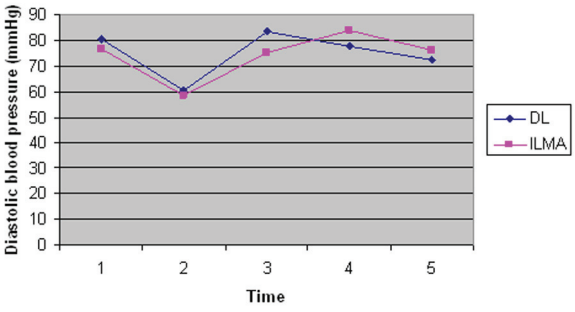

Fig. 4
Mean blood pressure changes (MBP) during intubation with direct laryngoscopy (DL) and intubating laryngeal mask airway (ILMA)

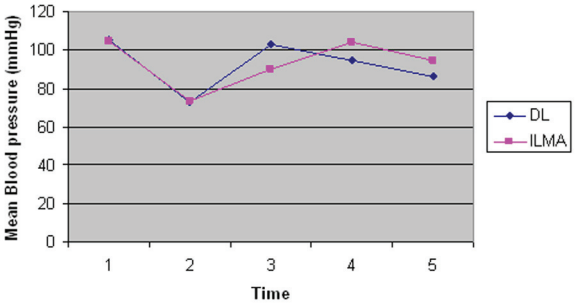

Table1
Definiton of times in figures

Time:	Definition:
1	baseline
2	1 minute before direct laryngoscopy (DL) or intubating laryngeal mask airway (ILMA)
3	1 minute after endo tracheal intubation (ETT)
4	2 minutes after ETT
5	5 minutes after ETT

Discussion

Regarding our data,it seems that there is no major difference among hemodynamic changes during endotracheal intubation via the ILMA and direct laryngoscopy for patients undergoing coronary artery surgery although minor differences still exist. A significant increase in heart rate and blood pressure

was detected in both groups after intubation. Despite existence of noted changes in both groups; quantity of these changes was similar in both groups. It means that chosen method did not affect how much heart rate and blood pressure rise, however quality of changes was not completely similar between groups. We could observe that hemodynamic changes start and abate earlier in course of intubation with direct laryngoscopy compared with ILMA. This can be explained by more prolonged period of intubation in ILMA group and more manipulations at time of removal.

Previous studies,show conflicting results in this regard.

In a trial undertaken by Kahl Martin et al, to evaluate the stress response of the intubation via ILMA and conventional laryngoscopy techniques in patients undergoing coronary artery surgery, eighty-six patients were enrolled. Heart rate,blood pressure and catecholamine levels were measured during anesthesia and intubation. Results demonstrated that reduction of cardiovascular and endocrine stress response associated with endotracheal intubation is more pronounced when performed via the intubating laryngeal mask. Thus, this technique can be helpful in high-risk cardiac patients[3].

In another study by Siddiqui NT et al, one hundred patients were investigated and results showed that intubation through intubating laryngeal mask airway is accompanied by minimal cardiovascular responses than those associated with direct laryngoscopic tracheal intubation, so it can be used for patients in whom a marked pressor response would be deleterious[14].

Third study was performed by Kihara et al.[4] In this study, the hemodynamic response after intubation was compared between a group of normotensive and a group of hypertensive patients-seventy five patients in each group, divided into three equal subgroups-using three different methods-direct laryngoscopy, ILMA and the trachlight lightwand device. In all groups, heart rate increased compared with preoperative baseline values without a significant difference between the groups, also the number of intubation attempts was similar among groups, but intubation time was significantly longer for the ILMA group than the other groups.

These disparities might be due to differences encountered in methods used for anesthesia (presence of premedication practice, dosage of drugs used for induction), intubation method (blind or assissted by fiber optic guidance)[9], investigted factors and intervals of measurments and timing of ILMA removal.

Several factors could cause bias in our results such as lack of enough experience about ILMA intubation, greater manipulations of head and neck during intubation with ILMA, longer duration of intubation with ILMA as a result of more complex procedure of intubation via ILMA consisting 3 stage of ILMA placement, intubation and removal of ILMA. All of these factors can accentuate hemodynamic changes in ILMA group which adversely affect our results. Also matching basal heart rate in both groups and comparing catecholamine levels an indicator of stress response after intubation increased yield of our results.

Although we could observe minor differences in hemodynamic changes between groups, we could not find significant differences. Finally we can hardly ascertain if intubation with ILMA is prefered method in patients with high cardiac risk or not. But it seems that ILMA does not have much greater benefit over conventional DL in patients undergoing CABG.

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