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# Comparative study between lidocaine and Metoprolol on hemodynamic attenuation during laryngoscope and endotracheal intubation

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## Abstract :

Haemodynamic stability is an integral and essential goal of any anaesthetic management plan. Laryngoscopy and intubation can cause striking changes in haemodynamics. **Objective** to compare lidocaine group with metoprolol group on the attenuation of hemodynamic responses to laryngoscopy and tracheal intubation, undergoing general anesthesia.

This randomized controlled study was conducted at collage health and medical technologiest in Teaching Baghdad Hospital, from(NOV._)2017.The study was conducted in 30 patients posted for elective surgery under general anesthesia. The patients were randomized into two equal groups to receive metoprolol 0.075 mg/kg (Group M = 15 patients) and lidocaine 1mg/kg (Group L = 15 patients). Following study drugs , anesthesia induced with Ketamine 1 mg / kg, propofol 2mg /kg and Rocuronium 0.6mg / kg IV. After 3minutes of injection of Rocuronium , Endotracheal intubation was done. Anesthesia was maintained with(1.2%)isoflurane, oxygen and Rocuronium. All intubation were done within 30 seconds then SBP, DBP,MAP and HR were recorded just after intubation, 1 minute,3minutes, 6 minutes and 10 minutes of intubation. We concluded metoprolol has more effect than lidocaine on hemodynamic attenuation during four times interval(1min,3min,6min and 10min)

**Keywords:** Hemodynamic parameters , **L**idocaine **,** Metoprolol .

## Introduction:

Laryngoscopy and tracheal intubation are essential in providing general anesthesia, but they produce sympathetic over drive by catecholamine release resulting in hypertension and tachycardia [1]. The hemodynamic stability can be simply defined as the stable blood flow, it means that a person has a stable heart pump and good circulation of blood, while hemodynamic instability is defined as any instability in blood pressure which can lead to inadequate arterial blood flow to organs, so critically ill patients need to be carefully monitored to avoid complications due to hemodynamic instability[2].

The main cause of transient hemodynamic instability and interruption of patient air way reflex is laryngoscopy and intubation[3]. The reflex cardiovascular responses to laryngoscopy and tracheal intubation were known to anaesthesiologists since a long time, so the haemodynamic stability is an integral and essential goal of any anaesthetic management plan , as well as endotracheal intubation stimulates the laryngeal and tracheal sensory receptors, resulting an increase of sympathetic stimulation[4].

The sympathetic stimulation results in tachycardia and elevation of blood pressure that may produce an exaggerated hypertensive response, especially in hypertensive patients, which may lead to cardiac arrest or cerebral stroke. Hemodynamic responses to laryngoscopy incubation were first described by ried and brace in 1940, and these responses are of little significance in healthy patients but may be fatal in patients with heart diseases and high blood pressure [5], the effect of drugs on the haemodynamic_responses can be known by monitoring the heart rate(HR), respiratory rate(RR), Blood pressure, Mean arterial

pressure(MAP), electrocardiography(ECG) and by calculating the Rate pressure product, Heart rate and the rate pressure product as determinants of cardiovascular risk in patients with hypertension.

There are several methods in modifying the hemodynamic responses: Lidocaine has a suppressive effect on the circulatory responses in patients undergoing laryngoscopy and tracheal intubation [6].whilst the β-adrenergic receptor antagonist like metoprolol decrease occurrence of arrhythmias and tachycardia caused by stressful stimulus during anaesthesia and reduce the neuroendocrine responses to surgical stimuli[7].

**Aim of study:** To assess the comparative effect between lidocaine and Metoprolol on hemodynamic changes systolic blood pressure(SBP); diastolic blood pressure(DBP); pulse rate(PR) and mean arterial blood pressure(MAP) attenuation during direct laryngoscopy and endotracheal intubation through the 4 time intervals(1min,3min,6min,10min).

## Materials and Methods:

This randomized controlled study was conducted at collage of Health and Medical Technologiest in Baghdad Teaching Hospital, from(NOV._)2017. The study design was approved from anesthetic department and informed consent was received from each patient after detailed explination of the procedure. Thirty patients were selected with American Society of Anesthesiologists (ASA) physical status I and II, aged between 15 to 60 years, and weighed 45 - 100 kg who are undergoing abdominal and pelvic surgery under general anesthesia were randomly allocated. The patients were divided into two groups: Lidocaine group (n = 15) and Metoprolol group (n = 15).

Exclusion criteria**:**1- Patients have a history of cardiovascular disease 2_cerebrovascular disease 3-psychosis 4-recent drug abuse 5-

respiratory problem 6- difficulty in intubation or repeated attempting of intubation were excluded from the study. Pre-anesthetic check-up was done in all the patients one day before surgery .after arrival at the operation theater, baseline parameters like heart rate (HR), systolic blood pressure (SBP) and the diastolic blood pressure (DBP) were measured by noninvasive blood pressure(NIBP).In addition, SpO2 and ECG were monitored continuously. IV cannulation was done with 20 gauge cannula. Patients received one of the two standardized treatment regimens prior to laryngoscopy, lidocaine group was received 1mg / kg iv lidocaine , and metoprolol group was received 0,075mg / kg metoprolol based on institutional protocol. All the drugs were prepared to the total volume of 12 ml to prevent biase. Drug preparation and the patients were done by the assistant anesthetic who was not involved in the study.

The patients and the researcher were blinded with the stress blunting agents given. Induction was done with Ketamine 1 mg / kg, propofol 2mg /kg and Rocuronium 0.6mg / kg IV. After 3minutes of injection of Rocuronium , Endotracheal intubation was done. Anesthesia was maintained with(1.2%)isoflurane with oxygen and Rocuronium. All intubation were done within 30 seconds then SBP, DBP, MAP and HR were recorded just after intubation, 1 minute,3minutes, 6 minutes and 10 minutes of intubation.

## Result:

**Table( 1):comparative effects between the studied groups(lidocaine group VS metoprolol group) on the heart rate in different time interval.**

| Group Statistics | | | | |
|---|---|---|---|---|
| | | | | |
| Heart rate | Drugs | Mean | Std. | P Value |

| | | | Deviation | |
|---|---|---|---|---|
| baseline | Lidocaine | 90.07 | 8.72 | 0.568 |
| | Metoprolol | 91.73 | 6.99 | |
| 1 min | Lidocaine | 94.87 | 7.86 | 0.002 |
| | Metoprolol | 84.8 | 8.42 | |
| 3min | Lidocaine | 91.6 | 8.71 | 0.000 |
| | Metoprolol | 75.73 | 7.85 | |
| 6min | Lidocaine | 89.13 | 8.44 | 0.000 |
| | Metoprolol | 66.4 | 6.48 | |
| 10min | Lidocaine | 88.07 | 9.04 | 0.000 |
| | Metoprolol | 55.6 | 5.29 | |

- There was no significant difference in heart rate between two groups (lidocaine group VS metoprolol group) at base line (p-value=0.568),While there was significant difference in heart rate between two groups at(1min,3min,6min and 10min) whereas metoprolol significantly reduced the heart rate as compere to lidocaine .

**Table(2):comparative effects between the studied groups(lidocaine group VS metoprolol group) on the mean atrial blood pressure in different time interval**

| Group Statistics | | | | |
|---|---|---|---|---|
| | | | | |
| Mean artrial blood pressure | Drugs | Mean | Std. Deviation | P Value |

| | | | | |
|---|---|---|---|---|
| Baseline | Lidocaine | 94.67 | 7.12 | 0.004 |
| | Metoprolol | 101.4 | 4.5 | |
| 1 min | Lidocaine | 99.13 | 6.8 | 0.001 |
| | Metoprolol | 91.13 | 4.66 | |
| 3min | Lidocaine | 91.07 | 7.06 | 0.000 |
| | Metoprolol | 79.8 | 3.12 | |
| 6min | Lidocaine | 86.47 | 6.44 | 0.000 |
| | Metoprolol | 70.93 | 2.02 | |
| 10min | Lidocaine | 83.47 | 5.94 | 0.000 |
| | Metoprolol | 63.13 | 3.78 | |

-Metoprolol decreased mean blood pressure after (1,3,6,10min)significantly while in Lidocaine group elevated B.p was recorded after 1.minute ,then followed by decrease in B.P after 3,6,10min .

- There was significant difference in mean artrial blood pressure between two groups (lidocaine group VS metoprolol group) at (base line,1min,3min,6min and 10min) .

**Table(.3):comparative effect between the studing groups(lidocaine group VS metoprolol group) on the dystolic blood pressure in different time interval**.

| Group Statistics | | | | |
|---|---|---|---|---|
| | | | | |
| Dystolic blood pressure | Drugs | Mean | Std. Deviation | P Value |
| Baseline | Lidocaine | 79.33 | 7.58 | 0.011 |
| | Metoprolol | 85.87 | 5.32 | |
| 1 min | Lidocaine | 83.87 | 7.61 | 0.012 |

| | | | | |
|---|---|---|---|---|
| | Metoprolol | 77.47 | 5.17 | |
| 3min | Lidocaine | 75.8 | 7.85 | 0.013 |
| | Metoprolol | 69.07 | 5.92 | |
| 6min | Lidocaine | 71.27 | 6.97 | 0.000 |
| | Metoprolol | 61.67 | 3.11 | |
| 10min | Lidocaine | 68.93 | 6.75 | 0.000 |
| | Metoprolol | 54.27 | 3.51 | |

- Metoprolol decreased diastolic blood pressure after (1,3,6,10min) significantly while in Lidocaine group elevated B.p was recorded after 1.minute ,then followed by decrease in B.P after 3,6,10min .

-There was significant difference in dystolic blood pressure between two groups ( lidocaine group VS metoprolol group) at (base line,1min,3min,6min and 10min).

**Table(4):comparative effect between the studing groups(lidocaine group VS metoprolol group) on the systolic blood pressure in different time interval.**

| Group Statistics | | | | |
|---|---|---|---|---|
| | | | | |
| Systolic blood pressure | Drugs | Mean | Std. Deviation | P Value |
| baseline | Lidocaine | 126.93 | 8.69 | 0.026 |
| | Metoprolol | 133.87 | 7.45 | |
| 1 min | Lidocaine | 131.4 | 8.38 | 0.000 |
| | Metoprolol | 117.8 | 7.89 | |
| 3min | Lidocaine | 122.33 | 7.65 | 0.000 |
| | Metoprolol | 101.47 | 4.84 | |

| | | | | |
|---|---|---|---|---|
| 6min | Lidocaine | 117.93 | 7.05 | 0.000 |
| | Metoprolol | 91.07 | 4.27 | |
| 10min | Lidocaine | 113.8 | 6.13 | 0.000 |
| | Metoprolol | 84.73 | 4.53 | |

Metoprolol decreased systolic blood pressure after (1,3,6,10min) significantly while in Lidocaine group elevated B.p was recorded after 1.minute ,then followed by decrease in B.P after 3,6,10min .

-There was significant difference in systolic blood pressure between two groups (lidocaine group VS metoprolol group) at (base line,1min,3min,6min and 10min).

**Discussion:**

The hemodynamic changes stemming from airway instrumentation are due to sympathoadrenal discharges caused by epipharyngeal and par pharyngeal stimulation[49]. Tracheal intubation is associated with an increase in heart rate and blood pressure, however, at the emergence of anesthesia additional haemodynamic responses to pain makes tracheal extubation more complicated[50].

Reid and Brace were the first to report the circulatory response to laryngeal and tracheal stimulation in anaesthetized man as tachycardia and increase in arterial blood pressure.Lidocaine and metoprolol have a suppressive effect on the circulatory responses in patients undergoing laryngoscopy and tracheal intubation [51].

The present study showed that both groups lidocaine group (1 mg/kg) and metoprolol group (0.075 mg/kg) were unequally effective in decreasing hemodynamic parameters ( systolic, diastolic, mean blood pressures and heart

rate) in both group (lidocaine and metoprolol ) which statistically highly significant (P<0.000).

lidocaine's effect on cardiomyocytes is inadequate to prevent heart repolarization[52]. Due to its anti-arrhythmic characteristics, lidocaine is used in the treatment of heart rate disturbances of ventricular origin [53].In an earlier study indicates that effect of lidocaine could be associated with protective activation of the sympathetic system secondary to airway manipulation and, thus, inhibition of the prolonged repolarization[54].

The metoprolol more effective than lidocaine in attenuattion the heart rate ,systolic blood pressure , diastolic blood pressure and mean arterial pressure during four times interval(1min,3min,6min and 10min) . Because metoprolol blocks sympathetic nervous system and decrease in heart rate and blood pressure[33].

**Conclusions:** Based on results of present study it may be concluded that both group ( lidocaine group and metoprolol group ) prevent the hemodynamic changes, However Clinically and statistically it can be concluded that metoprolol may be a better agent for hemodynamic attenuatio .Lidocaine may be prefers for cases in which the Beta -Blockers are contraindicated.

## Recommandation:

1. Metoprolol is highly recommended for attenuation of sympathetic response to direct laryngoscopy as a sole agent.
2. Detailed studies with larger samples are recommended to emphasize on the benfits of using metoprolol in patients with ischaemic heart disease.
3. Comparative effect study between lidocaine and Metoprolol in asthmatic patients>

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