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Original Contribution

The efficacy of labetalol vs dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation☆,☆☆,★

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Abstract

Objective: To assess the effectiveness of labetalol vs dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation.

Design: Prospective, randomized, controlled, observer-blinded study.

Setting: This study was carried out in Tanta University Hospital.

Patients: Ninety patients of both sexes; American Society of Anesthesiologists physical status I and II; age range from 20 to 60 years; scheduled for elective surgery under general anesthesia.

Interventions: Patients were divided into 3 groups (30 each). Group A received 1 μg/kg of dexmedetomidine as intravenous (IV) infusion, group B received labetalol 0.25 mg/kg IV, and group C received 10 mL saline IV.

Measurements: The groups were compared for heart rate (HR), mean arterial pressure (MAP), and rate pressure product (RPP). Hemodynamic parameters were recorded during the preinduction; after induction; at intubation; and at 1, 3, 5, 10, and 15 minutes. The primary outcomes were hemodynamic changes (HR, MBP, and RPP), and the secondary outcome was propofol dose requirement for induction of general anaesthesia.

Results: Significant decrease ($P < .05$) in HR, MBP, and RPP in groups A and B in comparison with group C and in group A in comparison with group B. Just before intubation, there was a significant decrease ($P < .05$) in HR, MBP, and RPP in groups A and B in comparison with group C. In group C, there was a significant increase in HR, MBP, and RPP at all points when compared with the baseline. In group A, the mean propofol induction dose (mg) was statistically significantly low as compared with that in groups B and C.

Conclusion: Dexmedetomidine attenuates the hemodynamic stress response to laryngoscopy and intubation more effectively compared with labetalol without any deleterious effects. Furthermore, dexmedetomidine decreases dose of propofol for induction of anesthesia as guided by bispectral index.

☆ Conflicts of interest: none.

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★ Contributions: Both authors helped design the study, collect data, and prepare the manuscript.

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1. Introduction

Rigid laryngoscopy and tracheal intubation have remained the gold standard in airway management inspite of the emergence of new airway devices in recent years. The hemodynamic responses resulting from airway instrumentation are due to sympathoadrenal discharge caused by epipharyngeal and parapharyngeal stimulations, which lead to a significant rise in the catecholamine level that increases blood pressure (BP) and pulse [1].

These hemodynamic responses may be fatal in susceptible patients such as those with coronary artery disease, hypertension, intracranial aneurysm, and cerebrovascular disease and may cause myocardial infarction, arrhythmias, left ventricle failure, and rupture of aneurysm [2].

Various pharmacological agents such as opioids [3], beta-adrenergic blockers [4,5], calcium channel antagonists [6], and clonidine [7] have been used to blunt the hemodynamic changes to laryngoscopy and intubation, but they all had limitations and not any of these is totally effective. So, it is desirable to use a drug with early, rapidly recognizable, and easily treatable adverse effects. The technique should be simple so that it can be useful as a routine practice.

Labetalol is an oral and parenteral antihypertensive drug that has α1- and nonselective β1- and β2-adrenergic antagonist. It reaches its peak effect at 5-15 minutes after intravenous (IV) injection and has 5.9 minutes of redistribution half-life. It decreases BP by lowering systemic vascular resistance (α1-blockade), whereas reflex tachycardia caused by vasodilatation is decreased by β-blockade with unchanging cardiac output [6].

Dexmedetomidine is a recent alpha-2 adrenergic agonist with 8 times more affinity for alpha-2 adrenoceptors when compared with clonidine. Pretreatment with dexmedetomidine attenuates hemodynamic changes to laryngoscopy and intubation [8,9].

The objective of this study was to assess the effectiveness of labetalol vs dexmedetomidine for attenuation of hemodynamic stress response to laryngoscopy and endotracheal intubation.

2. Patients and methods

This is a prospective, randomized, observer-blinded study conducted at Tanta University Hospital and carried out on 90 adult patients of both sexes during the period from May 2011 to March 2013 after approval by the hospital Ethical Committee. Written informed consent of the patient was obtained. The consolidated standards of reporting trial 2010 statement was followed in reporting this study.

Inclusion criteria were patients with American Society of Anesthesiologists (ASA) physical status I-II and age between 20 and 60 years scheduled for elective surgery under general anesthesia.

Exclusion criteria were age ≤20 years; known allergy to the anesthetic agents; history of a major psychiatric disorder; history of substance abuse and current opioid use; compromised renal, pulmonary, and cardiac status; diabetes; anticipated difficult intubation; hypertension; compensatory tachycardia; baseline pulse <60 beats per minute; baseline systolic blood pressure (SBP) <100 mm Hg; and those on medicines with cardiovascular effects.

All included participants were asked to take part in the study by the study personnel soon after admission to the ward, and a written informed consent was obtained from each patient.

Randomization was performed through a computer-generated, random-number list. The random-number list was generated by means of the QuickCalcs (GraphPad Software Inc, La Jolla, CA). The group assignment numbers were sealed in an envelope and kept by the study supervisor. After the written consent was signed, the opaque envelope was unsealed to determine which drug would be used.

Patients were randomly allocated into 3 groups of 30 patients each according to drug used. Group A received dexmedetomidine 1 μg/kg diluted in 100 mL of normal saline IV over a period of 10 minutes, and the infusion was completed 10 minutes before induction (Precedex; Hospira Worldwide, Lake Forest, IL). Group B received labetalol 0.25 mg/kg IV bolus10 minutes before induction of anesthesia (TRANDATE; Faulding Puerto Rico, Aguadilla, San Diedo), and group C (control group) received 10 mL saline IV [6,8].

All patients fasted for a minimum of 8 hours. In the operating room, a BIS-XP Quatro sensor (Aspect Medical Systems, Newton, MA) was applied to the forehead of the patient. The sensor was connected to a BIS-XP monitor (BIS XP, A-2000, Aspect Medical Systems) to evaluate the degrees of consciousness for each patient. The BIS sensor was placed simultaneously with other standard monitors before induction of anesthesia. A baseline BIS value, BP, heart rate (HR), and oxygen saturation were recorded every 5 minutes thereafter during the procedure by the anesthesiologist blinded about drug received. In the operation theater, the patient's body weight, fasting, consent, and preanesthetic checkup were checked. Baseline parameters (pulse rate [PR], SBP, diastolic blood pressure [DBP], mean arterial pressure [MAP], and rate pressure product [RPP]) were recorded. Rate pressure product was calculated from recordings of SBP and PR (formula: SBP × HR), which were recorded at various time intervals. The RPP is an index of myocardial oxygen demand. All subjects received antibiotic prophylaxis with ceftriaxone 1 g IV within an hour before surgery. All patients were premedicated by midazolam 0.2 mg/kg IV in the holding area. Then, general anesthesia was induced by IV fentanyl 1-1.5 μg/kg, propofol 1-2 mg/kg guided by BIS, and rocuronium 0.6 mg/kg to facilitate tracheal intubation; then rocuronium 0.15 mg/kg was given as maintenance. According to BIS value and patient hemodynamics, anesthesia was maintained with isoflurane 0.5-1.0 minimum