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SCIENTIFIC ARTICLE

Comparison of bolus and continuous infusion of esmolol on hemodynamic response to laryngoscopy, endotracheal intubation and sternotomy in coronary artery bypass graft

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Coronary artery;
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Abstract
Background and objective: The aim of this randomized, prospective and double blinded study is to investigate effects of different esmolol use on hemodynamic response of laryngoscopy, endotracheal intubation and sternotomy in coronary artery bypass graft surgery.
Methods: After approval of local ethics committee and patients' written informed consent, 45 patients were randomized into three groups equally. In Infusion Group; from 10 min before intubation up to 5th minute after sternotomy, 0.5 mg/kg/min esmolol infusion, in Bolus Group; 2 min before intubation and sternotomy 1.5 mg/kg esmolol IV bolus and in Control Group; %0.9 NaCl was administered. All demographic parameters were recorded. Heart rate and blood pressure were recorded before infusion up to anesthesia induction in every minute, during endotracheal intubation, every minute for 10 minutes after endotracheal intubation and before, during and after sternotomy at first and fifth minutes.
Results: While area under curve (AUC) (SAP × time) was being found more in Group B and C than Group I, AUC (SAP × T_{int} and T_{st}) and AUC (SAP × T_2) was found more in Group B and C than Group I ($p < 0.05$). Moreover AUC (HR × T_{st}) was found less in Group B than Group C but no significant difference was found between Group B and Group I.
Conclusion: This study highlights that esmolol infusion is more effective than esmolol bolus administration on controlling systolic arterial pressure during endotracheal intubation and sternotomy in CABG surgery.

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PALAVRAS-CHAVE
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Intubação endotraqueal;
Hemodinâmica em esternotomia;
Artéria coronária;
Cirurgia de revascularização

Comparação de esmolol em *bolus* e infusão contínua na resposta hemodinâmica à laringoscopia, intubação orotraqueal e esternotomia em cirurgia de revascularização coronária

Resumo
Justificativa e objetivo: o objetivo deste estudo prospectivo, randômico e duplo-cego foi investigar os efeitos do uso diferente de esmolol na resposta hemodinâmica à laringoscopia, intubação orotraqueal e esternotomia em cirurgia de revascularização coronária.
Métodos: após obter a aprovação do Comitê de Ética local e consentimento informado assinado pelos pacientes, 45 pacientes foram randomicamente divididos em três grupos. O Grupo I (infusão) recebeu 0,5 mg/kg/min de esmolol em infusão a partir de 10 min antes da intubação até 5 minutos após a esternotomia; o Brupo B (*bolus*) recebeu 1,5 mg/kg de esmolol em *bolus* IV a partir de 2 min antes da intubação e esternotomia; o grupo C (controle) recebeu NaCl a 0,9%. Todos os parâmetros demográficos foram registados. Os valores de frequência cardíaca e pressão arterial foram registrados desde antes da infusão até a indução da anestesia a cada minuto, durante a intubação endotraqueal, a cada minuto durante 10 min após a intubação endotraqueal e antes, durante e após a esternotomia no primeiro e quinto minutos.
Resultados: enquanto a área sob a curva (ASC) (SAP × tempo) foi maior nos grupos B e C que no Grupo I, a ASC (SAP × T_{int} e T_{st}) e ASC (SAP × T_2) foram maiores nos grupos B e C que no Grupo I ($p < 0,05$). Além disso, a ASC (FC × T_{st})) foi menor no Grupo B que no Grupo C, mas não houve diferença significante entre os grupos B e I.
Conclusão: este estudo destaca que a administração de esmolol em infusão é mais eficaz que em *bolus* para controlar a pressão arterial sistólica durante a intubação endotraqueal e esternotomia em CRC.

Introduction

Patients undergoing coronary artery bypass graft (CABG) surgery are at risk for perioperative myocardial ischemia. Tachycardia as a predictor for increased myocardial oxygen consumption which doubles the incidence of myocardial ischemia. During the operative procedure for coronary revascularization, some maneuvers, such as intubation, sternotomy and mediastinal preparation, may be associated with tachycardia and increases in blood pressure despite the adequate level of anesthesia.[1]

Some drugs (IV opioids, vasodilators, calcium channel and β-blockers) are available for the clinicians to control the hemodynamic response to laryngoscopy and intubation.[2] β-adrenoceptor blockers were shown to decrease the incidence of postoperative myocardial ischemia.[3]

Esmolol (metil-3[4-(2-hidroxy-3[izopropylamino]propxy) fenyl] is a specific cardioselective beta 1-blocker and it is hydrosoluble, without intrinsic sympathetic activity or membrane stabilizing activity at therapeutic dosages. Distribution and elimination half-life is 2 and 9 min, respectively. Esmolol is hydrolyzed by the blood esterases and a suitable agent for the perioperative period.[4]

Esmolol as a bolus or infusion was shown to prevent tachycardia and hypertension during laryngoscopy and intubation in a meta-analysis and previous studies.[5–7]

So far, esmolol bolus and infusion administration has not been previously compared in cardiac patients. The purpose of this randomized, prospective, double blinded study, was to evaluate the effect of 1.5 mg/kg esmolol bolus and 0.5 mg/kg/min esmolol infusion on hemodynamic response of laryngoscopy, endotracheal intubation and sternotomy in coronary artery bypass graft (CABG) surgery.

Methods

Forty five patients, aging between 18 and 80 years, ejection fraction >40%, in ASA II–IV status, scheduled for elective CABG surgery, between February and April 2006, in Ankara University Medical Faculty were enrolled to the study after obtaining approval from the Local Research Ethics Committee and written informed consent. Patients with asthma, first-degree atrioventricular block, heart rate <50 beats/min, acute myocardial infarction, Mallampati score more than two and under β-blocker treatment or contraindicated for β-blocker agent were excluded from the study.

One hour before the operation, patients were premedicated with 2.5 mg diazepam and 50 mg dolantine IM. Preoperative medical treatments were continued till the morning of the operation. Patients' age, gender, weight, height, chronic diseases and medications were recorded as demographic parameters. Upon their arrival to the operating room patients were monitored by pulse oximetry, electrocardiogram and non-invasive arterial blood pressure. An intravenous line was inserted with 18 gauge catheter and % 0.9 NaCl infusion was started, 0.04 mg/kg midazolam IV was administered. For invasive blood pressure monitorization, an intraarterial catheter was inserted into the left radial artery after local anesthetic infiltration. Sixty seconds after induction of general anesthesia with 0.3 mg/kg