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SCIENTIFIC ARTICLE

The effect of esmolol on corrected-QT interval, corrected-QT interval dispersion changes seen during anesthesia induction in hypertensive patients taking an angiotensin-converting enzyme inhibitor



Zahit Çeker, Suna Akın Takmaz*, Bülent Baltacı, Hülya Başar

Department of Anesthesiology and Reanimation, Ankara Training and Research Hospital, Ministry of Health, Ankara, Turkey

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KEYWORDS

Esmolol;
QT interval;
QT dispersion;
ACE inhibitor

Abstract

Background and objectives: The importance of minimizing the exaggerated sympathoadrenergic responses and QT interval and QT interval dispersion changes that may develop due to laryngoscopy and tracheal intubation during anesthesia induction in the hypertensive patients is clear. Esmolol decreases the hemodynamic response to laryngoscopy and intubation. However, the effect of esmolol in decreasing the prolonged QT interval and QT interval dispersion as induced by laryngoscopy and intubation is controversial. We investigated the effect of esmolol on the hemodynamic, and corrected-QT interval and corrected-QT interval dispersion changes seen during anesthesia induction in hypertensive patients using angiotensin converting enzyme inhibitors.

Methods: 60 ASA I–II patients, with essential hypertension using angiotensin converting enzyme inhibitors were included in the study. The esmolol group received esmolol at a bolus dose of 500 mcg/kg followed by a 100 mcg/kg/min infusion which continued until the 4th min after intubation. The control group received 0.9% saline similar to the esmolol group. The mean blood pressure, heart rate values and the electrocardiogram records were obtained as baseline values before the anesthesia, 5 min after esmolol and saline administration, 3 min after the induction and 30 s, 2 min and 4 min after intubation.

Results: The corrected-QT interval was shorter in the esmolol group ($p=0.012$), the corrected-QT interval dispersion interval was longer in the control group ($p=0.034$) and the mean heart rate was higher in the control group ($p=0.022$) 30 s after intubation. The risk of arrhythmia frequency was higher in the control group in the 4-min period following intubation ($p=0.038$).

Conclusion: Endotracheal intubation was found to prolong corrected-QT interval and corrected-QT interval dispersion, and increase the heart rate during anesthesia induction with propofol

* Corresponding author.

E-mail: satakmaz@gmail.com (S.A. Takmaz).

PALAVRAS-CHAVE

Esmolol;
Intervalo QT;
Dispersão do QT;
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Conversora de
Angiotensina (ECA)

in hypertensive patients using angiotensin converting enzyme inhibitors. These effects were prevented with esmolol (500 mcg/kg bolus, followed by 100 mcg/kg/min infusion). During induction, the blood pressure tends to decrease with esmolol where care is needed.

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Efeito de esmolol sobre o intervalo QT corrigido e alterações da dispersão do intervalo QT corrigido observadas durante a indução da anestesia em pacientes hipertensos que receberam um inibidor da enzima conversora de angiotensina

Resumo

Justificativa e objetivo: É óbvia a importância de minimizar as respostas simpatoadrenérgicas exageradas e o intervalo QT e a dispersão do intervalo QT que podem ocorrer por causa de laringoscopia e intubação traqueal durante a indução da anestesia em pacientes hipertensos. Esmolol diminui a resposta hemodinâmica à laringoscopia e à intubação. Porém, o efeito de esmolol sobre a redução do intervalo QT prolongado e a dispersão do intervalo QT induzida pela laringoscopia e intubação é controverso. Pesquisamos o efeito de esmolol sobre a hemodinâmica e o intervalo QT corrigido e as alterações da dispersão do intervalo QT observadas durante a indução da anestesia em pacientes hipertensos que receberam inibidores da enzima conversora de angiotensina (IECA).

Métodos: Foram incluídos no estudo 60 pacientes, estado físico ASA I-II, com hipertensão arterial essencial e que receberam IECA. O grupo esmolol recebeu uma dose em *bolus* de 500 mcg kg⁻¹, seguida por infusão contínua de 100 mcg kg⁻¹ min⁻¹ até o quarto minuto após a intubação. O grupo controle recebeu solução salina a 0,9%, semelhantemente ao grupo esmolol. Os valores da pressão arterial média e da frequência cardíaca e os registros do eletrocardiograma foram obtidos durante a fase inicial pré-anestesia, cinco minutos após a administração de esmolol e solução salina, três minutos após a indução e 30 segundos, dois minutos e quatro minutos após a intubação.

Resultados: O intervalo QT corrigido foi menor no grupo esmolol ($p=0,012$), o intervalo de dispersão do intervalo QT corrigido foi maior no grupo controle ($p=0,034$) e a frequência cardíaca média foi maior no grupo controle ($p=0,022$) 30 segundos após a intubação. O risco de frequência de arritmia foi maior no grupo controle no quarto minuto após a intubação ($p=0,038$).

Conclusão: Descobrimos que a intubação traqueal prolonga o intervalo e a dispersão do intervalo QT corrigido e aumenta a frequência cardíaca durante a indução da anestesia com propofol em pacientes hipertensos que receberam IECA. Esses efeitos foram prevenidos com esmolol (*bolus* de 500 mcg kg⁻¹, seguido de 100 mcg kg⁻¹ min⁻¹ de infusão). Durante a indução, a pressão tende a diminuir com esmolol. Portanto, cuidados são necessários.

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Introduction

A prolonged QT interval and corrected-QT interval (QTc) combined with QT interval dispersion (QTD) and corrected-QTD (QTcD) are known to increase the incidence of fatal arrhythmias such as polymorphic ventricular arrhythmia or ventricular fibrillation and cause sudden deaths by causing cardiac irritability.^{1,2} An increase in sympathetic activity and plasma catecholamine concentrations is known to cause prolongation of the QT interval and QT dispersion. Laryngoscopy and tracheal intubation have been shown to cause hyperdynamic responses such as hypertension, tachycardia, arrhythmia and prolongation of the QT interval.^{3,4} Although the observed hemodynamic responses are temporary, they may cause serious complications such as cerebral

hemorrhage, arrhythmia, myocardial ischemia or even infarction in the presence of accompanying cerebrovascular disease, coronary artery disease or hypertension.^{5,6}

Essential hypertension is the most common accompanying disorder in patients admitted for surgery.⁷ The disturbed cardiovascular homeostasis in hypertensive patients has been shown to cause a sympatho-vagal imbalance characterized by decreased vagal modulation and increased sympathetic activity.⁸ The response to laryngoscopy is significantly different in hypertensive patients compared to normotensive patients. The blood pressure changes that develop immediately following anesthesia induction are much larger in hypertensive patients. These patients have marked hypotension with induction and marked hypertension with laryngoscopy and intubation.⁹ A blood

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