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## SCIENTIFIC ARTICLE

# The comparison of the effects of dexmedetomidine, fentanyl and esmolol on prevention of hemodynamic response to intubation

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### KEYWORDS

Laryngoscopy;  
Intubation;  
Hemodynamic  
response;  
Dexmedetomidine;  
Fentanyl;  
Esmolol

### Abstract

**Background and objectives:** Laryngoscopy and intubation can cause hemodynamic response. Various medications may be employed to control that response. In this study, we aimed to compare the effects of dexmedetomidine, fentanyl and esmolol on hemodynamic response.

**Methods:** Ninety elective surgery patients who needed endotracheal intubation who were in American Society of Anesthesiology I–II group and ages between 21 and 65 years were included in that prospective, randomized, double-blind study. Systolic, diastolic, mean arterial pressures, heart rates at the time of admittance at operation room were recorded as basal measurements. The patients were randomized into three groups: Group I ( $n=30$ ) received  $1\ \mu\text{g}/\text{kg}$  dexmedetomidine with infusion in 10 min, Group II ( $n=30$ ) received  $2\ \mu\text{g}/\text{kg}$  fentanyl, Group III received  $2\ \text{mg}/\text{kg}$  esmolol 2 min before induction. The patients were intubated in 3 min. Systolic, diastolic, mean arterial pressures and heart rates were measured before induction, before intubation and 1, 3, 5, 10 min after intubation.

**Results:** When basal levels were compared with the measurements of the groups, it was found that 5 and 10 min after intubation heart rate in Group I and systolic, diastolic, mean arterial pressures in Group III were lower than other measurements ( $p < 0.05$ ).

**Conclusions:** Dexmedetomidine was superior in the prevention of tachycardia. Esmolol prevented systolic, diastolic, mean arterial pressure increases following intubation. We concluded that further studies are needed in order to find a strategy that prevents the increase in systemic blood pressure and heart rate both.

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**PALAVRAS-CHAVE**

Laringoscopia;  
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Resposta  
hemodinâmica;  
Dexmedetomidina;  
Fentanil;  
Esmolol

## Comparação entre os efeitos de dexmedetomidina, fentanil e esmolol na prevenção da resposta hemodinâmica à intubação

**Resumo**

*Justificativa e objetivos:* Laringoscopia e intubação podem causar resposta hemodinâmica. Vários medicamentos podem ser usados para controlar essa resposta. Neste estudo, nosso objetivo foi comparar os efeitos de dexmedetomidina, fentanil e esmolol sobre a resposta hemodinâmica.

*Métodos:* Foram incluídos no estudo prospectivo, randômico e duplo-cego 90 pacientes programados para cirurgias eletivas, com intubação endotraqueal, estado físico ASA I-II, entre 21 e 65 anos. Pressões arteriais médias, sistólicas, diastólicas e frequências cardíacas foram medidas ao darem entrada na sala de operações e registradas como valores basais. Os pacientes foram randomizados em três grupos: Grupo I (n = 30) recebeu 1 µg/kg de dexmedetomidina com infusão em 10 min; Grupo II (n = 30) recebeu 2 µg/kg de fentanil; Grupo III (n = 30) recebeu 2 mg/kg de esmolol 2 min antes da indução. Os pacientes foram intubados em 3 min. As pressões médias, sistólicas e diastólicas e as frequências cardíacas foram medidas antes da indução, antes da intubação e nos minutos 1, 3, 5 e 10 após a intubação.

*Resultados:* Quando os níveis basais foram comparados entre os grupos, verificou-se que nos minutos 5 e 10 pós-intubação as frequências cardíacas no Grupo I e as pressões arteriais médias, sistólicas e diastólicas no Grupo III estavam mais baixas do que em outros tempos mensurados (p < 0,05).

*Conclusões:* Dexmedetomidina foi superior na prevenção de taquicardia. Esmolol preveniu o aumento das pressões arteriais médias, sistólicas e diastólicas após a intubação. Concluímos que estudos adicionais são necessários para descobrir uma estratégia que previna tanto o aumento da pressão arterial sistêmica quanto da frequência cardíaca.

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**Introduction**

During general anesthesia airway control is generally provided by laryngoscopy and intubation. Laryngoscopy and intubation lead to mechanical and chemical stimuli. Mechanical stimulus causes reflex responses in cardiovascular and respiratory systems.<sup>1</sup> That response reaches its maximum level within 1 min and ends in 5–10 min after intubation. On the other hand, chemical stimulus results with catecholamine release via increase in sympathoadrenergic activity. Catecholamine release leads to hypertension, tachycardia and arrhythmia. Tachycardia generates a more powerful load on the heart when compared with hypertension as it increases oxygen consumption of the myocardium, decreases diastolic filling and finally reduces coronary blood supply.<sup>2</sup>

The degree of the reflex response of laryngoscopy and intubation is related with the deepness of anesthesia, patient's age and the presence of diabetes or heart disease. Narcotic analgesics, local anesthetics, beta-blockers, calcium canal blockers and vasodilators are employed in order to control that response.<sup>3</sup> Dexmedetomidine is a selective  $\alpha_2$  adrenergic agonist. Its effects on cardiovascular system are particularly prominent.<sup>4,5</sup> The effect of fentanyl on cardiovascular system is not much. The exact reason of bradycardia due to fentanyl use is not clear, but it is considered to be related with central vagal stimulation.<sup>6</sup> Among these agents, esmolol is a cardioselective  $\beta$  adrenergic blocker that has an effect with rapid onset and short duration. While it inhibits  $\beta_1$  receptors of myocardium, it

also inhibits  $\beta_2$  receptors of smooth muscles of bronchial and vascular walls at higher doses.<sup>7</sup>

In this study, we aimed to compare the effects of dexmedetomidine, fentanyl and esmolol on control of hemodynamic response due to laryngoscopy and intubation.

**Methods**

The study was approved by Ethical Board of Ankara Numune Training and Research Hospital. Ninety elective surgery patients who were in American Society of Anesthesiology (ASA) I and II groups and whose ages were between 21 and 65 years were included in that study. The study was planned as a prospective, double blind and randomized study. Those in whom difficulty in intubation was expected, who had coronary artery disease, hypertension, chronic obstructive pulmonary disease or diabetes and who were using any cardiovascular medication were excluded.

All patients were examined one day before and their laboratory results were reviewed. Included patients received necessary information about the study and gave their written consents. Before admittance to operation room, vascular access was obtained from the back of the hand with 20G canula and 10 mL/kg/hour Ringer's lactate infusion was started. Following transferring to operation room, premedication with 0.01 mg/kg iv midazolam was performed. CAMS II (Comprehensive Anesthesia Monitor) was used for routine monitorization; ECG and heart rate (HR) were monitored at standard DII derivation; systolic (SAP), diastolic

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