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SCIENTIFIC ARTICLE

Relationship between cigarette smoking and the carbon monoxide concentration in the exhaled breath with perioperative respiratory complications

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KEYWORDS
Smoking;
CO exhaled;
Peri-operative;
Respiratory complications;
Laparoscopic cholecystectomy

Abstract
Background: The purpose of the current study was to determine the effects of preoperative cigarette smoking and the carbon monoxide level in the exhaled breath on perioperative respiratory complications in patients undergoing elective laparoscopic cholecystectomies.
Methods: One hundred 52 patients (smokers, Group S and non-smokers, Group NS), who underwent laparoscopic cholecystectomies under general anesthesia, were studied. Patients completed the Fagerstrom Test for Nicotine Dependence. The preoperative the carbon monoxide level in the exhaled breath levels were determined using the piCO+ Smokerlyzer 12 h before surgery. Respiratory complications were recorded during induction of anesthesia, intraoperatively, during extubation, and in the recovery room.
Results: Statistically significant increases were noted in group S with respect to the incidence of hypoxia during induction of anesthesia, intraoperative bronchospasm, bronchodilator treatment intraoperatively, and bronchospasm during extubation. The carbon monoxide level in the exhaled breath and the Fagerstrom Test for Nicotine Dependence, and number of cigarettes smoked 12 h preoperatively were designated as covariates in the regression model. Logistic regression analysis of anesthetic induction showed that a 1 unit increase in the carbon monoxide level in the exhaled breath level was associated with a 1.16 fold increase in the risk of hypoxia (OR = 1.16; 95% CI 1.01–1.34; $p = 0.038$). Logistic regression analysis of the intraoperative course showed that a 1 unit increase in the number of cigarettes smoked 12 h preoperatively was associated with a 1.16 fold increase in the risk of bronchospasm (OR = 1.16; 95% CI 1.04–1.30; $p = 0.007$). While in the recovery room, a 1 unit increase in the Fagerstrom Test for Nicotine Dependence score resulted in a 1.73 fold increase in the risk of bronchospasm (OR = 1.73; 95% CI 1.04–2.88; $p = 0.036$).

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Conclusions: Cigarette smoking was shown to increase the incidence of intraoperative respiratory complications while under general anesthesia. Moreover, the estimated preoperative the carbon monoxide level in the exhaled breath level may serve as an indicator of the potential risk of perioperative respiratory complications.

PALAVRAS-CHAVE
Tabagismo;
CO expirado;
Perioperatório;
Complicações respiratórias;
Coleistectomia laparoscópica

Relação entre consumo de tabaco e concentração de monóxido de carbono na expiração com complicações respiratórias perioperatórias

Resumo
Justificativa: O objetivo deste estudo foi determinar os efeitos do tabagismo pré-operatório e o nível de monóxido de carbono no ar expirado (eBCO) sobre complicações respiratórias perioperatórias em pacientes submetidos a colecistectomias laparoscópicas eletivas.
Métodos: No total, 152 pacientes (Grupo F: fumantes; Grupo NF: não-fumantes) submetidos a colecistectomias laparoscópicas sob anestesia geral foram avaliados. Os pacientes completaram o Teste para Dependência de Nicotina de Fagerstrom (FTND). Os níveis pré-operatórios de eBCO foram determinados usando o piCO + Smokerlyzer 12 h antes da cirurgia. As complicações respiratórias foram registradas durante a indução da anestesia, no intraoperatório, durante a extubação e na sala de recuperação.
Resultados: Aumentos estatisticamente significativos foram observados no Grupo F em relação à incidência de hipoxia durante a indução da anestesia, broncoespasmo intraoperatório, tratamento broncodilatador intraoperatório e broncoespasmo durante a extubação. O nível de eBCO, FTND e o número de cigarros fumados em 12 h no pré-operatório foram designados como covariáveis no modelo de regressão. A análise de regressão logística da indução anestésica mostrou que um aumento de 1 unidade no nível de eBCO foi associado a um aumento de 1,16 vezes do risco de hipoxia (OR = 1,16; IC de 95% 1,01–1,34; p = 0,038). A análise de regressão logística do período intraoperatório mostrou que um aumento de 1 unidade no número de cigarros fumados em 12 h no pré-operatório foi associado a um aumento de 1,16 vezes no risco de broncoespasmo (OR = 1,16; IC de 95% 1,04–1,30, p = 0,007). Enquanto na sala de recuperação, um aumento de 1 unidade no escore do FTND resultou em um aumento de 1,73 vezes no risco de broncoespasmo (OR = 1,73; IC de 95% 1,04–2,88; p = 0,036).
Conclusões: O tabagismo mostrou aumentar a incidência de complicações respiratórias intraoperatórias sob anestesia geral. Além disso, o nível estimado de EBCO no pré-operatório pode servir como um indicador do risco em potencial de complicações respiratórias perioperatórias.

Introduction

Cigarette smoking, one of the most serious health-threatening problems, is responsible for the increasing incidence of chronic disorders of the respiratory and circulatory systems.[1–4] It has been reported that the probabilities of small airway narrowing, chronic lung changes, and increased bronchial reactivity should be considered during administration of anesthesia in patients who smoke cigarettes.[5] In addition, postoperative pulmonary complications, such as pharyngitis, coughing, and apnea occur more frequently in smokers. The postoperative mortality rate is higher in smokers than non-smokers.[6–10] Pulmonary function, in particular, is affected by stimulation of the abdominal organs during laparoscopic cholecystectomy and gallbladder traction.[11]

There are a number of studies which have focused on the incidence of perioperative respiratory complications in patients who have discontinued or reduced cigarette smoking weeks before surgery.[4,7,8] Although the physiologic effects of long-term cessation of cigarette smoking before surgery are widely known, including the reduction in respiratory complications, the effects of preoperative cessation of smoking over a short period of time have not been thoroughly investigated.[12,13] A number of studies involving cigarette smoking have relied on self-reporting, and detailed smoking data have not been recorded in retrospective studies.[1,4,13] The estimated the carbon monoxide level in the exhaled breath e(BCO) level is a simple, non-invasive, rapid, and inexpensive technique that helps confirm the interval of non-smoking.[2–4,14,15]

In the current study we determined the relationships between perioperative respiratory complications during

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