Revista Colombiana de Anestesiología
Colombian Journal of Anesthesiology
www.revcolanest.com.co

Scientific and Technological Research

Effect on cough frequency and intensity during extubation of two plasma concentrations of remifentanil using TACAN: Randomised controlled clinical trial☆,☆

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ARTICLE INFO

Article history:
Received 8 June 2016
Accepted 2 March 2017
Available online 31 March 2017

Keywords:
Airway extubation
Anesthesia
Cough
Airway management
Controlled clinical trial

ABSTRACT

Introduction: Cough at the time of extubation may trigger anaesthesia-related adverse events. A technique that has been found to limit cough during this stage of the anaesthesia procedure is the use of remifentanil.

Objective: To compare cough frequency and intensity at the time of extubation with two different plasma concentrations of remifentanil, 3–4 ng/ml and 2–3 ng/ml, using target controlled anaesthesia.

Materials and methods: Randomised controlled clinical trial carried out at the Institute for Blind and Deaf Children in Valle del Cauca, in patients taken to elective ear surgery. Patients were randomly assigned to one of two groups. The first group (T) received an infusion of remifentanil at a plasma concentration of 3–4 ng/ml ($n = 50$). The second group (U) received an infusion of remifentanil at a plasma concentration of 2–3 ng/ml ($n = 51$). Data were analysed using the Student *t* test and the non-parametric Mann Whitney *U* test; the Chi square test was used for determining associations.

Results: Cough intensity and frequency were less in group T compared to group U (OR: 3.73; 95% CI: 1.3–10.7), and there was no difference between the two groups regarding emergence from anaesthesia.

Conclusions: The presence of at least one cough episode during extubation is less with plasma concentrations of remifentanil of 3–4 ng/ml than 2–3 ng/ml.

☆ Please cite this article as: Tafur-Betancourt LA, Arévalo-Sánchez M, Lema-Flórez E. Efecto de dos concentraciones plasmáticas de remifentanilo a través de TACAN sobre la frecuencia e intensidad de la tos durante la extubación: Ensayo Clínico Controlado Aleatorizado. Rev Colomb Anestesiol. 2017;45:92–99.

☆ Clinical Trials: NCT02711904.

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Efecto de dos concentraciones plasmáticas de remifentanilo a través de TACAN sobre la frecuencia e intensidad de la tos durante la extubación: Ensayo Clínico Controlado Aleatorizado

Palabras clave:
Extubación traqueal
Anestesia
Tos
Manejo de la vía aérea
Ensayo clínico controlado

RESUMEN

Introducción: La presencia de tos al momento de la extubación puede desencadenar eventos adversos asociados a la anestesia. Una técnica reportada para disminuir la tos durante esta parte del acto anestésico es la extubación con remifentanilo.
Objetivo: Comparar la frecuencia y la intensidad de la tos en el momento de la extubación con dos concentraciones plasmáticas de remifentanilo de 3-4 y de 2-3 ng/ml, a través de la técnica anestésica con objetivo controlado.
Materiales y métodos: Se realizó un ensayo clínico controlado aleatorizado en el Instituto para Niños Ciegos y Sordos del Valle del Cauca, en pacientes sometidos a cirugía programada de oído. Los pacientes fueron divididos aleatoriamente en dos grupos. El primer grupo (T) recibió una infusión de remifentanilo con una concentración plasmática entre 3-4 ng/ml (n = 50). El segundo grupo (U) recibió una infusión de remifentanilo con una concentración plasmática entre 2-3 ng/ml (n = 51). Los datos se analizaron mediante la prueba estadística de la t de Student y la prueba no paramétrica de la U de Mann Whitney; para establecer asociaciones se realizó la prueba Chi-cuadrado.
Resultados: La intensidad y la frecuencia de la tos fue menor en el grupo T que en el grupo U (OR: 3.73; IC 95%: 1.3–10.7); el tiempo de despertar no mostró diferencia entre ambos grupos.
Conclusiones: La presencia de al menos un episodio de tos durante la extubación es menor cuando se alcanzan concentraciones plasmáticas de remifentanilo entre 3-4 ng/ml que entre 2-3 ng/ml.

Introduction

Extubation takes place at a time in which the plasma concentration (PC) of the anaesthetic agents is reaching zero and the patient is still subject to a mechanical painful stimuli such as tracheal intubation that elicit coughing and haemodynamic changes including hypertension, tachycardia, increased pressure (intra-abdominal, intraocular, intracranial pressure), myocardial ischaemia and arrhythmias. Opioid doses have been used to suppress the cough stimulus at the time of extubation (CTE); however, published studies report a high incidence of cough. With remifentanil at a PC of 1.5 ng/ml, 31% of patients presented CTE when sevoflurane was administered. These studies are not clear regarding the concentration of the hypnotic agent at the time of extubation. This could explain why, in different studies, different remifentanil PC have the same results in terms of cough frequency. Unfortunately, prior designs have not considered the concept of no-response probability (NRP) based on target controlled anaesthesia (TACAN), which consists of keeping in mind the synergistic interactions between these drugs.

To avoid this bias, synergistic interactions must be considered, and this requires adjusting the opioid dose according to age and making sure that there is no effect of the hypnotic agent during extubation. In this study, infusions were adjusted according to age in order to achieve a PC of remifentanil, and care was taken to ensure a final concentration of the halogenated drug under 0.1 ET.

The objective of this study was to compare cough frequency and intensity at the time of extubation with two infusions of remifentail that predict a plasma concentration between 3–4 and 2–3 ng/ml, using target controlled anaesthesia.

Materials and methods

Randomised double-blind clinical trial carried out in a Clinic in Cali in patients taken to ear surgery after obtaining the approval of the ethics committee and patient informed consents. Patients were randomly assigned to two groups: the intervention group received an infusion of remifentanil to predict a PC between 3 and 4 ng/ml, and the control group received a remifentanil infusion to predict a PC between 2 and 3 ng/ml at the time of extubation.

Based on preliminary studies in which the cough frequency with a PC of 1.5 ng/ml of remifentanil was 30%, the one-tail sample size to reduce cough frequency from 30% to 10% with an alpha error of 0.05 and a power of 0.8 is 46 patients in each group.[1,2] With an estimated loss of 20%, the total is 55 patients in each group.

Considering the need to manage two groups – remifentanil concentration of 2–3 ng/ml (group U) and remifentanil concentration of 3–4 ng/ml (group T), the epidemiology department of Hospital Departamental del Valle Evaristo García carried out a