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GENERAL SURGERY REPORTS

Calculating variant of ketamine infusion in manually TIVA

Víctor Navarrete Zuazo, Damaris Flores Vargas, Reinier Meneses

Clínica Central Cira García, Cuba

Abstract

Introduction: A requirement in the conduction of total intravenous anesthesia (TIVA), manually conducted, lies in the need for dosage adjustments to prevent temporary plasmatic accumulation of the drug as an infusion maintained at a constant rate without decrement will increase the plasmatic concentration of the drug up to the ceiling of its therapeutic window. Manual TIVA is often used due to technological limitations for using the TCI mode. For several years there has been an interest to use other drugs such as ketamine.

Objectives: To analyze and compare the probable temporary variation of ketamine plasma concentration (Pc) after an invariable administration of the infusion rate, and applying a calculation variable of decrease in the rate of infusion (Vinf).

Methods: An analytical study was made to describe the manually TIVA dosage calculation, pharmacokinetic simulation of ketamine Pc behavior, in case of an invariable administration with those dosage regimens, in a 70 kg virtual patient, according to Domino model and the analysis of decrease calculation variant of the drug Vinf . A statistical significance of 95% ($p<0.05$) was estimated.

Results: The calculation variable of decrease in the rate of infusion: Vinf (tn) = Vinf (tn-1) - [(Vinf (tn-1) x e(1 + 1/t)t)/100] = Vinf (tn-1) x 0.85 allowed more steady values of the Pc, approximate to the ideal model ($p>0.05$), for 6 hours. Because of practical reasons for the anesthesiologist, the variations of the Vinf (tn) were established from 15 minutes and stablish the rest of the variation moments according to the moment in which the simulation curve reached the desired plasmatic concentration. After this commented analysis, the moments for variation in the case of ketamine were 15, 30, 50, 90 minutes, 2 y 50 minutes y 5 hours y 45 minutes. Once determined the objective, the following results were obtained.

Simulation 1: Ketamine (S1-K)
Pharmacokinetics characteristics of the maual TIVA model: Therapeutic range of the Pc (mcg / ml) = 0.05 -0.3; Vd tpeak(ml / kg) = 63; CL(ml / kg / min) = 64.9
Ketamine dilution in syringe = 2 mg / ml. Calculations for Pc = 0.3 mcg / ml: Bolus Dose = 2 mg (0.02 mg / kg); Vinf = 1.17 mg / kg / h (48.1 ml / h). A variant of decrement calculation was analysed (Vinf (tn) = Vinf (tn-1) x 0.85) and the following values of Cp(t) were obtained.

Simulation 2: Ketamine (S2-K)

Data: The employed in S1-K, when the variation of initial infusion speed was applied (1.17 mg / kg / h) according to the formula
Vinf (tn) = Vinf (tn-1) _ [(Vinf (tn-1) x e(1 + 1/t)t)/100] = Vinf (tn-1) x 0.85.

Conclusions: it is probably that the decrease of ketamine dosage, established by the proposed infusion and calculation variant, enables a better stability of the Pc.

Biography

Dr Víctor Navarrete Zuazo works in the Clínica Central Cira García in Cuba

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Citation: Víctor Navarrete Zuazo, *Calculating variant of ketamine infusion in manually TIVA*, Anaesthesia Meet 2020, World Conference on Anaesthesiologists and Surgeons, Amsterdam, Netherlands, 14-07-2020, 02