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Research Article

Anesthetic Induction with Ketofol for the Burned Patient

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Received: December 17, 2019; **Published:** December 31, 2019

Abstract

Objective: Evaluate hemodynamic changes in burned patient's during anesthetic induction using ketofol.

Materials and Methods: A comparative study was conducted with a random selection forming two groups: propofol and ketofol. Monitoring vital signs in several minutes after induction.

Results: 30 patients were included in each group. During induction of anesthesia with propofol patients had decreased 50% BIS while the group ketofol the decline was gradual maintaining spontaneous ventilation for one minute; in terms of hemodynamics in both groups was no difference in heart rate and peripheral arterial oxygen saturation pre and post induction. There was significant difference in values of mean arterial pressure after induction, a decrease of 30% in the propofol group and 10% in the group ketofol. T test was performed for independent samples obtained values of p = 0.004 at 5 minutes after induction, p = 0.08 at 10 minutes, p = 0.009 at 15 minutes.

Conclusion: The combination of ketamine with propofol for induction of burn patient keeps the patient's hemodynamic status.

Keywords: *Ketofol; Burned Patients; Anesthetic Induction*

Introduction

The burn is located in the 18th place within the main causes of morbidity in Mexico [1]. Thermal aggression produces alterations in the homeostatic equilibrium that compromises macro- and microcirculation. As a result of endothelial dysfunction and the increase in microvascular hyperpermeability, changes and losses of fluid in the circulation occur and therefore hypovolemia can occur after large burns [2-4]. Therefore, the surgical act in the severely burned patient is a top-level anesthetic challenge, since one of the intervals of general anesthesia during which episodes of hypotension occur in a prevalent way is the period after anesthetic induction and before of initiating the surgical stimulus [5-7]. During induction, the organism is subjected to abrupt changes in homeostasis in a very short period of time, so hemodynamic instability may occur, and some other situations that may endanger the life of the burned patient [8].

Due to the above, it is believed that anesthetic induction with ketofol maintains the hemodynamic state of burned patients as opposed to induction with ketamine or propofol as individual agents [9-14]. Therefore it is necessary to evaluate the variations in the hemodynamic state of the burned patient during anesthetic induction with the use of ketamine plus propofol (ketofol) by measuring the mean blood pressure, heart rate and peripheral arterial saturation of patients burned after induction; as well as assess the degree of hypnosis through BIS secondary to induction with ketofol.

Materials and Methods

Prior authorization of the Ethics Committee of the General Hospital "Dr. Rubén Leñero" a comparative, longitudinal, prospective study was carried out that included patients of the Burns Unit of both sexes, of legal age with superficial and deep second degree burns, as well as third degree burns caused by any agent (thermal or chemical) that they were scheduled for surgical cleaning, tangential excision or graft taking and application in the period from March to May 2016 and that required general anesthesia.

Based on the pre-anesthetic assessment and surgical programming, a random selection was made per day of detriment ($SatO_2$), five lead electrocardiogram (HR) and bamanometer (PANI). Baseline vital signs were recorded, verification of permeable route and pre-oxygenation with 60% O_2 FiO_2 was performed through a face mask, subsequently initiating anesthetic induction according to the group to which each patient belonged. Propofol group: induction with fentanyl at 5 µg/kg, followed by vecuronium neuromuscular relaxant at 100 µg/kg and subsequently with propofol at 2 mg/kg giving 4 minutes of latency, approach of the airway after drug latency was performed - Collogic and fall of BIS to less than 50.

Ketofol group: a mixture of ketamine + 1: 1 propofol with 100 mg of each undiluted inducer was made, leaving 8.3 mg of ketofol per milliliter. Induction with fentanyl at 5 µg/kg, vecuronium at 100 µg/kg, ending with ketofol at 1 mg/kg with 4 min latency, approaching the airway after pharmacological latency and BIS fall to less than 50. In both groups, vital signs were recorded at the post-induction minute at 5' and 10'. Maintenance with sevrane at 2 MAC + fentanyl bolus at 3 µg/kg. The anesthetic management of the patients was standardized and always by the same anesthesiologist.

Both groups were comparable in terms of type of burn and extent of the burned body surface, as well as in the presence of drug addiction, both in the control group and in the experimental group, men between 18 and 45 years consumed some type of drug, marijuana prevailing, however, in terms of comorbidities, a comparison was not possible since only one patient with diabetes mellitus was present in the control group and three patients with epilepsy in the experimental group. Excel was used for data emptying and subsequently for statistical analysis central tendency measures were used for demographic variables and for T-test variables for dependent and independent samples [15-17].

Results

From each group 30 patients were included, which were chosen randomly; of the total number of patients, the following distribution was obtained (Table 1). Regarding the parameters measured in both groups to assess induction, we found that during the anesthetic-anesthetic induction with propofol, patients presented a 50% BIS drop in baseline of the 15 seconds after the administration of the drug and apnea together keeping BIS below 40 for the next 10 minutes post-induction, while in the ketofol group this drop in BIS value was observed gradually maintaining spontaneous ventilation during a minute and subsequently presenting apnea and BIS less than 50 and keeping the BIS above 40 at 10 minutes after induction. On the other hand, in the assessment of hemodynamics (Table 2), the values of the pre and post-induction vital signs are shown, which in the ketofol group showed minimal variations compared to the propofol group.

	Gender		Age	%SCQ	Percentage and type of most frequent surgery
	F	M	Average	Average	
Propofol 30 patients	6%	94%	38.2 years/± 12.5	26.4%/± 12.5	Surgical toilet + take and graft application 57%
Ketofol 30 patients	20%	80%	34.8 years/ ± 14.9	34.5%/± 14.8	Surgical toilet 40% + 37% tangential excision

Table 1: *Distribution of each induction group.*
Gender: Female and male, age range used for average of both groups of 18 to 80 years, percentage range of burned body surface area (%SCQ) of 5 - 60%.

Group	Pre induction			Post induction								
	5 min			10 min			15 min					
Vitals	FC-x/DE	TAM-x/DE	$SatO_2$%-x/DE	FC-x/DE	TAM-x/DE	$SatO_2$%-x/DE	FC-x/DE	TAM-x/DE	$SatO_2$%-x/DE	FC-x/DE	TAM-x/DE	$SatO_2$%-x/DE
Propofol	84.3 ± 17.5	90.8 ± 13.6	94.4 ± 3.9	79.4 ± 16.8	77.6 ± 14.2	98.2 ± 1.7	78.5 ± 16.8	75.9 ± 12.8	98.8 ± 0.85	76.3 ± 14.1	71.4 ± 11.5	98.7 ± 0.6
Ketofol	87.4 ± 19	89.5 ± 21.6	91.9 ± 6.3	77.6 ± 17	89.54 ± 18	96.8 ± 4.5	77.6 ± 16.2	82.4 ± 19.4	97.5 ± 4.3	75.7 ± 17.5	81.6 ± 20.3	98 ± 2.3
T test for uneven variances				T = -2.95 p = 0.004			T = -1.73 p = 0.08			T = -2.69 p = 0.009		

Table 2: *Assessment of pre and post induction vital signs in study groups.*
FC: Heart Rate; TAM: Average Blood Pressure, $SatO_2$%: Percentage of Peripheral Oxygen Saturation;
X: Geometric Mean; DE: Standard Deviation. T-test with 1.96 confidence level and a 50 error.

Discussion

Induction is one of the periods covered by the anesthetic act, being one of its objectives the hemodynamic stability of the patients, a fact that depends on the drugs administered and the synergy that they have depending on their effects on the organism, is that is why there are no ideal agents that avoid abrupt changes of homeostasis during induction. Secondary to the pharmacological processes and their impact on the hemodynamics of the patients, in the burned patient the anesthetic act is much more complex, since it depends on the type of burn, the degree of surface affected and the time of trauma evolution, since it is going through a hyperdynamic phase in which the regulation of physiological processes is affected without leaving behind the main risk factor of the burned patient, which is the extravasation state and hypovolemia.

Due to the above, there is an interest in performing anesthetic induction with drugs that, thanks to their effects, offer a neutral hemodynamic profile. In the literature the use of the combination of ketamine-propofol (ketofol) is well known for sedation and especially in pediatrics, thanks to the hemodynamic stability it offers and preserved ventilatory automatism; however, its effect as an inducer and especially the doses is poorly studied.

Studies such as that of Daabiss M., *et al.* [9] in 2009 and Aboeldahab., *et al.* [10] in 2011 used ketofol as an inducing agent in both trauma patients as well as patients in scheduled surgeries, within the studies they did not obtain significance. Statistical lack of hemodynamic maintenance, however, there were clinical differences, as well as postoperative benefits in terms of analgesia and control of nausea and vomiting [18]. The doses used in the studies were: Daabiss M., *et al.* [9] 600 µ/kg of initial bolus with an infusion of 100 µ/kg of maintenance with ketofol dilutions of 1:1 and 4:1 (propofol: ketamine) and on the other hand Aboeldahab., *et al.* [10] calculated 70 µ/kg in a 0.5: 0.5 dilution, since they used a 1: 1 concentration but the mixture was diluted with glucose solution; In our investigation, it was found that when the concentration of drugs was diluted, their efficacy decreased.

Other studies [11-13] handle subanesthetic doses of ketamine combined with maximum doses of propofol, however, studies have not It has been conclusive in terms of hemodynamic stability, which is why in our study it was decided to decrease the dose of propofol and increase the dose of ketamine by managing both inductors with low anesthetic doses [19], resulting in adequate synergy, since stability in heart rate was shown, a discrete drop in mean arterial pressure which had no impact on peripheral O_2 saturation. On the other hand, as regards the monitoring of the bispectral index (BIS), a faster decrease is observed in the patients of the propofol group, however, the latency of the ketofol group was constant, at the minute of the pharmacological administration there is a decrease of the BIS, without However, this index has a recovery in a period of two minutes to values of 85 or more, so that anesthesia adjuvants such as halogenates or

opioids are required to keep the patient in an anesthetic plane, despite this fact and the administration of halogenates within the study. Ketofol patients had no sudden hemodynamic changes.

Conclusion

The combination of ketamine with propofol (ketofol) as an inducing agent maintains the hemodynamic state of the patient burned during anesthetic induction unlike the induction of these drugs as individual agents accepting the hypothesis of this work, so this study could give It guides new investigations of the use of ketofol in the burned patient, since the combination of both drugs tends to show a neutral hemodynamic profile as well as both inducers are drugs of common use and low cost.

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Volume 6 Issue 1 January 2020