Recovery after ECT: comparison of propofol, etomidate and thiopental

Recuperação pós-eletroconvulsoterapia: comparação entre propofol, etomidato e tiopental

Moacyr A Rosa,[1] Marina O Rosa,[1] Iara M T Belegarde,[1] Celso R Bueno,[1] Felipe Fregni[2]

Abstract

Objectives: *To compare post anesthetic time for patient recovery after electroconvulsive therapy, as measured by the post anesthetic Recovery Score of Aldrete and Kroulik, using three different types of hypnotic drugs (propofol, etomidate and thiopental).* ***Method:*** *Thirty patients were randomized to receive one of the three drugs (n = 10 in each group), during a course of electroconvulsive therapy treatment. Patients and raters were blinded to which drug was received. Main treatment characteristics were recorded (as total electric charge received seizure threshold, number of treatments, and the mean time for recovery) along the whole treatment.* ***Results:*** *Thiopental and propofol were associated with a significance increase in charge needed to induce a seizure ($p < 0.0001$) when compared to etomidate, as well as a significant decrease of time for recovery ($p = 0.042$).* ***Conclusions:*** *These findings suggest that, although there seems to be no difference in the clinical outcome across these three drugs, propofol offers the best recovery profile. However, it makes a higher mean electric charge necessary.*

Descriptors: *Electroconvulsive therapy; Anesthesia; Medication systems; Diagnosis, medicamentous; Recovery, psychomotor*

Resumo

Objetivos: *Comparar o tempo de recuperação dos pacientes após eletroconvulsoterapia avaliada com a escala de recuperação pós-anestésica de Aldrete e Kroulik, utilizando três tipos de medicações anestésicas (propofol, etomidato and tiopental).* ***Método:*** *Trinta pacientes foram randomizados para receber uma das medicações (n = 10 em cada grupo) durante uma série de tratamentos com eletroconvulsoterapia. Os pacientes e o examinador ficaram cegos para o tipo de anestésico utilizado. As principais características do tratamento foram avaliadas (como carga total de eletricidade recebida, limiar convulsivo, número de sessões e o tempo médio para recuperação) ao longo de toda a série de tratamentos.* ***Resultados:*** *Tiopental e propofol se associaram a um aumento significativo na carga elétrica total utilizada ($p < 0,0001$) quando comparados com etomidato, bem como uma diminuição significativa no tempo de recuperação pós-anestésica ($p = 0,042$).* ***Conclusões:*** *Estes achados sugerem que, apesar de não haver diferença na evolução clínica entre os três grupos estudados, a droga propofol oferece o melhor perfil de recuperação apesar de requerer uma carga elétrica média maior.*

Descritores: *Eletroconvulsoterapia; Anestesia; Sistemas de medicação; Diagnóstico medicamentoso; Recuperação psicomotora*

[1] Department of Psychiatry, Universidade de São Paulo (USP), São Paulo (USP), Brazil
[2] Department of Neurology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, USA

Institute of Psychiatry, Clinical Hospital, Medical School, Universidade de São Paulo (USP), São Paulo (SP), Brazil

Correspondence
Moacyr A Rosa
Institute of Psychiatry, Universidade de São Paulo
Rua Dr. Ovídio Pires de Campos, 785
05403-010 São Paulo, SP, Brasil
Phone/Fax: (55 11) 3069-6525
E-mail: moarosa@hcnet.usp.br

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Introduction

Electroconvulsive therapy (ECT) is a widely used treatment for many mental disorders, especially depression.[1] Since its first use in 1938 until nowadays, the technique has become safer and with fewer side effects. The introduction of anesthesia made risks of fractures and muscle pain absent and the treatment more comfortable, safer and easier to be accepted by patients.[2]

The most used medications for anesthesia induction in ECT include methohexital, thiopental, etomidate and propofol.[2]

Methohexital is the drug of choice for ECT anesthesia but it is not available in Brazil.[3] Thiopental is a barbituric derivate, like methohexital, and its use is limited by a longer time of action and anticonvulsant effects.[2] Propofol is a short acting non barbituric also widely used, with antihypertensive properties.[4] Its main limitation is that it shortens seizure duration, possibly making ECT ineffective for some patients.[5] Finally, etomidate is an imidazolic non barbituric derivate, with rapid onset, short time of action and fast metabolization. It has not analgesic properties and induces minimal cardio-respiratory effects. [6] Therefore, it is the drug of choice for patients with cardiac insufficiency.[7] It also induces mioclonic movements with no clinical significance and has a minimal effect on seizure threshold. It is the drug mostly used in our Service.

There are few studies comparing the different drugs used for ECT anesthesia[8-11] and most of them are focused on the effects on seizure duration[12] and seizure threshold.

The aim of this randomized, double blind study was to compare post anesthetic recovery between three of the main drugs used in ECT (thiopental, propofol and etomidate).

Method

The study protocol and informed consent were approved by the local Research Ethics Committee, and all patients signed it before their enrollment in the trial.

The sample consisted of 30 patients who were scheduled to receive ECT, aged 18 to 60, with major depression according to DSM-IV and a minimum score of 22 as measured by the Hamilton Rating Scale for Depression (HRSD).[13] They were randomly assigned to receive etomidate, propofol or thiopental during their course of ECT.

Patients and raters were blinded to which anesthetic drug was given.

In each ECT session, post anesthetic recovery was evaluated using the post anesthetic Recovery Score of Aldrete and Kroulik.[14] This scale monitors recovery through clinical observations, such as movement of extremities, respiration, systolic blood pressure, level of consciousness and skin coloration. The classic assessment is performed after arrival at recovery room and then after 1 hour, 2 hours and 3 hours, although some hospitals include assessments every 15 minutes during the first hour. Scores vary from 0 to 10 and scores of 8-9 are considered safe. As post ECT recovery takes a very short time compared with other procedures, mean time for recovery for each patient in each session was also recorded (patients were evaluated every 2-3 minutes; right after patients recovered spontaneous respiration, they went to the recovery room and time began to be counted.). Rater measured the total time (in minutes) to achieve a score of, at least, 8. Patients were evaluated in all sessions received, and the mean time for recovery was recorded.

ECT was performed according to international standards approved in our Institution. A SpECTrum 5000 Q® (MECTA Corporation, Lake Oswego, OR) was used. All patients used right unilateral electrode placement[15] and seizure was monitored with EEG recording. Method of limits (titration) was used in the first session to determine seizure threshold (ST). In the following sessions, a charge of 6 times ST was used.

During each ECT session, patients received Oxygen 100%. For neuromuscular blockade, succinylcholine (0.5-1.25 mg/Kg IV) was used. All patients also received atropine (0.25-0.5 mg IV). The anesthetic dosages were: etomidate at 0.15-0.30 mg/Kg intravenous (IV), propofol at 1.0-1.5 mg/Kg IV, and thiopental at 2.0-3.0 mg/Kg IV. Each patient received the same anesthetic drug during the study, until the end of the ECT sessions.

All analyses were carried out using SAS v 9.0 (Cary, NC, USA). The aim of this study was to investigate the effects of the three different types of anesthetics. We initially studied the relationship of anesthetics with post anesthetic recovery and some other characteristics of the sample (as total charge received, seizure threshold, and total number of treatments received). Logistic regression models in which the dependent variable was the time for recovery and the independent variable was the anesthetic type were performed. We dichotomized the dependent variables using the median as a cutoff. A multinomial logistic regression model was performed in which propofol and thiopental were compared with etomidate. This model has an advantage as the Wald test can calculate the overall significance of a variable taking into account all the levels of the dependent variable and therefore increasing the power of this analysis.

Given we used categorical data, our sample size (10 patients in each group) is sufficient to detect differences in proportion with the magnitude of 0.3 using a power of 90% and alpha of 5%. In other words a change in 30% of recovery time would be detected using our sample size. We considered that a smaller change in recovery time would not be considered clinically significant.

Results

Main characteristics of the groups can be seen in Table 1.

No statistical difference was found for mean number of sessions between the groups (7.9 ± 1.5 for propofol, 8.7 ± 1 for etomidate, and 8.8 ± 0.4 for thiopental). The variables total electric charge received ($p < 0.0001$), and time for patient recovery ($p = 0.042$) were significantly associated with the type of anesthetic used. For instance, thiopental and propofol were associated with a significant increase in charge (OR = 5.33 and OR = 18.97, respectively) when compared to etomidate, as well as a significant decrease of time for recovery (OR = 0.49 and OR = 0.50, respectively). The multinomial logistic regression model confirmed these findings, as charge ($p = 0.0002$) and time for patient recovery ($p = 0.014$) remained significant after the adjustment for the other variables. Propofol needed the highest charge but had the shortest time for recovery. No difference was observed between groups related to seizure threshold and total number of treatments received.

Discussion

Post anesthetic recovery in ECT is a very important issue with practical implications for psychiatrists who work directly with ECT and for practitioners who prescribe it. The more comfortable the treatment, the better will be the patients' compliance and satisfaction. Although any of the drugs used in this study showed a very short time for recovery, the best one was propofol. On the other hand, clinical superiority for practical purposes could not be proved, as time differences detected were around only 2 minutes between drug groups.

Table 1 - Main characteristics of the groups

Variable*	Propofol	Etomidate	Thiopental	P value**
Gender (male/female)	4/6	4/6	4/6	1
Age	42.9 (11.6)	40.3 (10.3)	50.4 (12.1)	0.82
Baseline Hamilton	23.6 (5.6)	25.0 (6.1)	25.0 (4.9)	0.69
Time for recovery***	7.4 (1.9)	10.7 (3.6)	9.4 (2.3)	0.042
Charge received (mC)	820.4 (232.1)	434.5 (158.2)	564.5 (259.2)	0.0001

** Mean (SD); except gender = n*
*** One-way ANOVA for continuous variable (age and Hamilton); Fisher's exact test for gender; logistic regression for time for recovery and charge received*
**** In minutes (Aldrete/Kroulik)*
Two sample t-tests: propofol vs. etomidate (p = 0.01); Etomidate vs. Thiopental (p = 0.16); Propofol vs. Thiopental (p = 0.17) – note that propofol vs. etomidate comparison is still significant with the correction for multiple comparisons using Bonferroni correction.

An important point is that higher charges given are commonly associated with more frequent post ictal confusion. The significantly higher mean charge used with propofol (that could possibly make post ECT recovery worse) did not prevent it to show the best post anesthetic recovery profile.

The main limitation of the study is that the scale used has different variables to measure recovery (such as color of skin, movement of the legs etc, more important for surgical procedures than for ECT). The most important one to patients undergoing ECT seems to be the level of consciousness (especially orientation), a variable that has a low sensitivity. Another limitation of our study is the relatively small sample size. Using this sample size, the number of variables that can be included in the multivariate model is limited. Indeed our model can only accept two or three variables at the same time. Therefore, larger sample sizes are necessary to build more complex models that include other variables and confounders.

Finally, clinical improvement or memory side effects were not compared in the current study and no conclusion can be drawn about the superiority of any of these drugs in clinical practice. In fact, the slight superiority found was not significant enough to make it the drug of choice, independently of other variables.

Studies comparing time for and quality of re-orientation and patients' satisfaction for different drugs are highly encouraged.

References

1. Abrams R. *Electroconvulsive Therapy.* 4nd ed. New York (NY): Oxford University Press; 2002.
2. Beyer JL, Weiner RD, Glenn MD. *Electroconvulsive therapy: a programmed text.* 2nd ed. Washington (DC): American Psychiatric Press; 1998.
3. American Psychiatric Association. *The practice of electroconvulsive therapy: recommendations for treatment, training, and privileging. A task force report of the American Psychiatric Association.* 2nd ed. Washington, DC: American Psychiatric Association Press; 2001.
4. Nettelbladt P. Factors influencing number of treatments and seizure duration in ECT: drug treatment, social class. *Convuls Ther.* 1988;4(2):160-8.
5. Mitchell P, Torda T, Tickie I, Burke C. Propofol as an anaesthetic agent for ECT: effect on outcome and length of course. *Aust N Z J Psychiatry.* 1991;25(2):255-61.
6. Wauquier A. Profile of etomidate: a hypnotic, anticonvulsant and brain protective compound. *Anaesthesia.* 1983;38(Suppl):26-33.
7. Kellner CH, Pritchett JT, Beale MD, Coffey CE. *Handbook of ECT.* Washington (DC): American Psychiatric Press; 1997.
8. Avramov MN, Husain MM, White PF. The comparative effects of methohexital, propofol and etomidate for electroconvulsive therapy. *Anesth Analg.* 1995;81(3):596-602.
9. Martensson B, Bartfai A, Hallen B, Hellstrom C, Junthe T, Olander M. A comparison of propofol and methohexital as anesthetic agents for ECT: effects on seizure duration, therapeutic outcome and memory. *Biol Psychiatry.* 1994;35(3):179-89.
10. Trzepacz PT, Weniger FC, Greenhouse J. Etomidate anesthesia increases seizure duration during ECT: a retrospective study. *Gen Hosp Psychiatry.* 1993;15(2):115-20.
11. Gran L, Bergsholm P, Bleie H. Seizure duration in unilateral electroconvulsive therapy: a comparison of the anaesthetic agents etomidate and althesin with methohexitone. *Acta Psychiatr Scand.* 1984;69(6):472-83.
12. Christensen P, Kragh-Sorensen P, Sorensen C, Thomsen HY, Iversen AD, Christensen KS, Huttel M, Tonnesen E. EEG-Monitored ECT: a comparison of seizure duration under anesthesia with etomidate and thiopental. *Convuls Ther.* 1986;2(3):145-50.
13. Hamilton M. A rating scale for depression. *J Neurol Neurosurg Psychiatry.* 1960;23:56-62.
14. Aldrete JA, Kroulik D. A postanesthetic recovery score. *Anesth Analg.* 1970;49(6):924-34.
15. d'Elia G. Unilateral electroconvulsive therapy. *Acta Psychiatr Scand Suppl.* 1970;215:1-98.