Rev Bras Anestesiol. 2017;xxx(xx):xxx–xxx

Sociedade Brasileira de Anestesiologia

REVISTA BRASILEIRA DE ANESTESIOLOGIA

Publicação Oficial da Sociedade Brasileira de Anestesiologia
www.sba.com.br

SCIENTIFIC ARTICLE

Sugammadex by ideal body weight versus 20% and 40% corrected weight in bariatric surgery – double-blind randomized clinical trial

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Received 17 July 2017; accepted 19 October 2017

KEYWORDS
Sugammadex;
Bariatric surgery;
Body weight;
Neuromuscular block;
Postoperative residual curarisation

Abstract
Background and objectives: The weight parameters for use of sugammadex in morbidly obese patients still need to be defined.
Methods: A prospective clinical trial was conducted with sixty participants with body mass index $\geq 40\,kg.m^{-2}$ during bariatric surgery, randomized into three groups: ideal weight (IW), 20% corrected body weight (CW20) and 40% corrected body weight (CW40). All patients received total intravenous anesthesia. Rocuronium was administered at dose of $0.6\,mg.kg^{-1}$ of Ideal weight for tracheal intubation, followed by infusion of $0.3–0.6\,mg.kg^{-1}.h^{-1}$. Train of four (TOF) was used to monitor depth of blockade. After spontaneous recovery TOF-count 2 at the end of surgery, $2\,mg.kg^{-1}$ of sugammadex was administered. Primary outcome was neuromuscular blockade reversal time to TOF ≥ 0.9. Secondary outcome was the occurrence of postoperative residual curarization in post-anesthesia recovery room, searching the patient's ability to pass from the surgical bed to the transport, adequacy of oxygenation, respiratory pattern, ability to swallow saliva and clarity of vision.
Results: Groups were homogenous in gender, age, total body weight, ideal body weight, body mass index, type and time of surgery. The reversal times (s) were (mean ± standard deviation) 225.2 ± 81.2, 173.9 ± 86.8 and 174.1 ± 74.9 respectively, in the IW, CW20 and CW40 groups ($p = 0.087$).
Conclusions: No differences were observed between groups with neuromuscular blockade reversal time and frequency of postoperative residual curarization. We concluded that ideal body weight can be used to calculate sugammadex dose to reverse moderate neuromuscular blockade in morbidly obese patients.

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https://doi.org/10.1016/j.bjane.2017.10.011

Please cite this article in press as: Duarte NM, et al. Sugammadex by ideal body weight versus 20% and 40% corrected weight in bariatric surgery – double-blind randomized clinical trial. Rev Bras Anestesiol. 2017. https://doi.org/10.1016/j.bjane.2017.10.011

PALAVRAS-CHAVE
Sugamadex;
Cirurgia bariátrica;
Peso corporal;
Bloqueio neuromuscular;
Curarização residual pós-operatória

Uso de sugamadex pelo peso corporal ideal *versus* corrigido em 20% e 40% em cirurgia bariátrica – ensaio clínico randômico e duplo-cego

Resumo
Justificativa e objetivos: Os parâmetros de peso para o uso de sugamadex em pacientes com obesidade mórbida ainda precisam ser definidos.
Métodos: Um ensaio clínico prospectivo foi realizado com sessenta participantes com índice de massa corporal $\geq 40\,kg.m^{-2}$, submetidos a cirurgia bariátrica, randomizados em três grupos: peso ideal (PI), peso corrigido em 20% (PC20) e peso corrigido em 40% (PC40). Todos os pacientes receberam anestesia intravenosa total. Rocurônio foi administrado em dose de $0,6\,mg.kg^{-1}$ para intubação traqueal pelo peso ideal, seguido de infusão ($0,3$ a $0,6\,mg.kg^{-1}.h^{-1}$). A sequência de quatro estímulos (TOF) foi usada para monitorar a profundidade do bloqueio. Após recuperação espontânea da segunda resposta do TOF ao final da cirurgia, $2\,mg.kg^{-1}$ de sugamadex foi administrado. O desfecho primário foi o tempo de reversão do bloqueio neuromuscular até obter TOF $\geq 0,9$. O desfecho secundário foi a ocorrência de curarização residual pós-operatória na sala de recuperação pós-anestésica, avaliando a capacidade do paciente para passar do leito cirúrgico para o de transporte, adequação da oxigenação, padrão respiratório, habilidade para deglutir saliva e clareza de visão.
Resultados: Os grupos foram homogêneos quanto ao gênero, idade, peso corporal total, peso corporal ideal, índice de massa corporal, tipo e tempo de cirurgia. Os tempos de reversão (segundos) foram (média $\pm$ desvio padrão) $225,2 \pm 81,2$, $173,9 \pm 86,8$ e $174,1 \pm 74,9$, respectivamente, nos grupos PI, PC20 e PC40 ($p = 0,087$).
Conclusões: Não foram observadas diferenças entre os grupos quanto ao tempo de reversão do bloqueio neuromuscular e frequência de curarização residual pós-operatória. Concluímos que o peso corporal ideal pode ser usado para calcular a dose de sugamadex para reverter o bloqueio neuromuscular moderado em pacientes com obesidade mórbida.

Introduction

Obesity is currently a major health problem worldwide and is associated with a disproportionate increase in adipose tissue in relation to lean body mass.[1] Individualized criteria taking into account composition modifications should be used to calculate doses for this kind of patient.[2] However, the compounds used for anesthesia are developed in studies with patients without comorbidities or with only one (such as kidney or liver disease). This strategy excludes morbidly obese patients. Data for this particular population are obtained after drugs have already been approved by regulatory agencies and made commercially available. The use of ideal or total body weight for administration of drugs in morbidly obese patients may result in insufficient or excessive doses, adverse effects and/or poor clinical outcomes.[3,4]

In laparoscopic abdominal surgeries, especially bariatric ones, muscle relaxation facilitates pulmonary ventilation and establishes adequate conditions for surgery.[5] Some authors advocate the use of deep neuromuscular blockade to reduce the risk of physiopathological repercussions of pneumoperitoneum and accidental lesions caused by surgical instruments.[6] But more recent studies disagree with this statement, because they found no advantage of deep against the moderate block.[7] Anyway, incomplete reversal of motor blockade at the end of surgery is associated with lack of protection of airways, owing to poor functioning of the larynx muscles, with consequent increase in postoperative morbidity and mortality related to bronchoaspiration, hypoxemia, athelectasia, pneumonia and other complications.[8] In this situation, systematic monitoring and adequate reversal of motor blockade are protective factors and their use should be encouraged and monitored by health services.[9,10]

Sugammadex, a modified gamma-cyclodextrin, is the first direct neuromuscular blocker antagonist[11] capable of shortening blockade reversal time and reducing side-effects associated with residual postoperative curarization or the use of neostigmine and atropine.[12] However, the recommended dose is based on initial publications that have not factored in the peculiarities of morbidly obese patients.[13,14] More recent studies of morbid obesity and sugammadex have produced conflicting findings.[15–20]

The possibility of immediate reversal of any level of neuromuscular blockade with sugammadex have enabled more liberal use of rocuronium, providing adequate relaxation until the completion of laparoscopic surgery.[21,22] Continuous infusion of rocuronium has been studied and successfully used, to obtain and maintain specific target concentration in plasma and in the effector site, providing a more stable and efficient level of blockade[23]; its use on this basis, followed by sugammadex-induced reversal, may be a good option for anesthesia in morbidly obese patients. However, it is still necessary to establish which body weight parameters doses of sugammadex should be based on for antagonism of this pattern of neuromuscular blockade.

The present study compared neuromuscular blockade reversal time induced by continuous infusion of rocuronium and the occurrence of residual postoperative paralysis in

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