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Economic Impact of Expanding the Use of Sugammadex for the Reversal of Neuromuscular Blockade in Adults Undergoing Surgery in Spain

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Background and Goal of Study: Neuromuscular blocking agents (NMBAs) are often administered to prevent patient movement during surgical procedures requiring use of general anesthetics with intubation. Patients extubated with incomplete neuromuscular reversal may experience residual neuromuscular paralysis, potentially leading to post-operative complications. The aim of this study is to estimate the clinical and economic impact of expanding sugammadex use in the routine reversal of NMB with rocuronium in Spain. NMB induced by cisatracurium and others are included in the analysis with caveat that patients are switched to rocuronium first.
Materials and Methods: A budget impact analysis was developed based on a decision analytic model that followed 733,876 hospital procedures carried out in Spain in 2015,73.3% of them using a NMBA. The model estimated the annual net Budget impact of substituting sugammadex for no reversal agent in 50% of the patients administered with rocuronium and no reversal agent. The risk of the composite endpoint, PPC (post-operative pulmonary complications), was based on a study of the Multicenter Perioperative Outcomes Group(MPOG) centralized research registry. The analysis was conducted from payers' perspective, considering only the direct costs associated with PPC management(€6,990.01 per episode) and pharmacy costs of the NMBAs. Deterministic sensitivity analyses (DSA) were carried out by varying key parameters included in the model within a range of +/- 25%.
Results and Discussion: The estimated budget impact of expanding the use of sugammadex in 226,119 procedures, displacing neostigmine or no reversal agent use, in the routine reversal of neuromuscular blockade in Spanish hospitals was a net savings of M€8.1 annually. The potential increase (M€13.9) in pharmacy costs would be offset by savings (M€22) from a reduction in the number of PPC events (3,148 cases; 12.8%).The DSA confirmed that the economic impact of expanding the use of sugammadex resulted in cost savings across all variables varied except for where the risk ratio (sugammadex vs neostigmine) of PPC decreases (from 0.71 to 0.89).
Conclusion: Improving patient care in the operating room is essential in surgical procedures. The management of PPC is often expensive. Expanding the use of sugammadex could potentially lead to a reduction in the number of PPC events, resulting in net savings for the Spanish National Healthcare System.

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Deep neuromuscular blockade with sugammadex reversal, reduced both anesthetic requirements and recovery times in cervical spine surgery patients: a randomized controlled trial

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Background and Goal of Study: Deep neuromuscular blockade (NMB) is currently used mostly for the benefit of laparoscopic surgeries. We hypothesized that deep NMB could also offer advantages regarding titration of BIS guided propofol/ remifentanil anesthesia. EMG activity, if present, may lead to higher artifacted BIS values and higher doses of anesthetics. We conducted a randomized controlled trial to assess whether deep NMB could eliminate EMG activity, reduce BIS variability and result in the use of reduced doses of anesthetics and of their hemodynamic side effects.
Materials and Methods: Patients subjected to cervical spine surgery (N=63) were randomized to receive rocuronium infusion for deep NMB (PTC of 1-2 kept until the end of wound dressing) with sugammadex (4mg/kg) for reversal or standard-practice rocuronium boluses with neostigmine for reversal if TOF<90%. Propofol/ remifentanil TCI anesthesia was titrated to maintain BIS between 40-60. Trial had national EC/regulatory authority approvals; all patients provided informed consent. Student's t test, Mann-Whitney U-test and chi-square c2were used. When samples were compared the 95% IC of the difference is presented. Significance was at p<0,05.
Results and Discussion: Baseline characteristics did not differ among groups. The main results are in Fig1. Propofol estimated Ce for maintenance and total propofol in mg/kg/min were 20% lower in the deep NMB group. BIS average was significantly higher, by 3,3(1,06) and EMG activity significantly reduced in the deep NMB group, but BIS variability was not. Remifentanil did not differ. Ephedrine was administered in 34% of patients in the standard practice group vs 13% in the deep NMB group (P=0,045). At end of surgery propofol Ce was lower in the deep NMB group and times to eye opening and extubation were halved.
Conclusion: Deep NMB and sugammadex reversal accounted for reduced propofol requirements during anesthesia, higher BIS values, decreased EMG activity, less need to treat hypotension and faster recovery times. Possible explanations for these findings may be that deep NMB reduces EMG activity leading the anesthesiologist to accept higher BIS values, or that it reduces afferences to the brain, namely from proprioception, that would favor arousal. While deep NMB is advocated only to provide better surgical conditions, our results suggest that it may be beneficial also from the perspective of anesthesia.

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Sugammadex reversal versus neostigmine: analysis of rapid muscle activity recovery

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Background: The purpose of the study is to test the rapid muscle activity recovery of sugammadex vs neostigmine after surgery through microlaryngoscopy.
Materials and methods: A systematic multicentric and retrospective review of our recorded data were analyzed. We enrolled 148 patients between 39 and 68 years old, ASA I-II, undergoing ENT. The patients were divided into two groups: S (74 pts) and N (74 pts). The group S received sugammadex in a dose dependent on the depth of the block. The patients of Group N received neostigmine for decurarization. In both groups the curarization was obtained by the administration of rocuronium. The recovery time and the achievement of the TOF-ratio 0.9 as extubation index were recorded.
Results: At the end of surgery (mean duration 28 ± 7 min) the TOF showed a partial recovery in 111 patients; in the remaining 37 patients a post-tetanic counts (PTC) was performed to assess the depth of the block and the recommended dose of sugammadex was administered. Of the 111 patients with moderate muscular block and reappearance of T2 to TOF, 33 patients were included in group S with administration of 2 mg/kg of sugammadex while 78 were included in Group I with administration of neostigmine 0.05 mg/kg. 37 patients in which PTC showed a value of 1-2, indicating deep block, were antagonized with sugammadex 4 mg/kg. Times muscle recovery, were respectively: 1 min, 33±6 sec for 33 patients of the group S antagonized at the appearance of T2; 6 min and 45±5 sec for 78 patients of group I and 2 min 42± 3 sec for 11 patients of Group S antagonized during deep block (PTC = 1-2). At a TOF ratio 0.9 all patients were extubated. No case of PORC/PONV were recorded (Fig. 1).
Discussion and conclusion: The study showed that the administration of sugammadex determined a shortening of muscle recovery from rocuronium when compared with neostigmine with advantage during microlaryngoscopy.
References:
1. Geldner G. A randomised controlled trial comparing sugammadex and neostigmine at different depths of neuromuscular blockade in patients undergoing laparoscopic surgery. Anaesthesia 2012; 67:991-8.

INCREASED P WAVE AMPLITUDE (%)	CVC TIP/ACJ DISTANCE (cm.)
25%	2.4±1.2 cm.
33%	1.8±1.0 cm.
50%	1.2±0.4 cm.

Table 1. ECG increased P wave amplitude vs CVC tip distancve from ACJ