

Short Communication

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Sugammadex vs Neostigmine Side Effects in Functional Endoscopic Sinus Surgery with Total Intravenous Anaesthesia and Rocuronium Neuromuscular Blockade: Observational Study

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Abstract

Introduction: There is concern about the risk of residual neuromuscular blockade in airway surgery which may lead to airway obstruction, hypoxia and mortality. Though Neostigmine is routinely used, sugammadex has been used recently for rapid reversal without side effects. The aim of the study was using these reversal agents in Functional endoscopic sinus surgery (FESS) to compare their reversal time and their side effects encountered.

Methods: This is an observational study for FESS in which alternate ASA class I-III patients were assigned to receive either Neostigmine or Sugammadex. Patients allergic to narcotics or muscle relaxants or renal dysfunction or neuromuscular disorders were excluded. GA was standardised to use Propofol, Remifentanil TCI and Rocuronium. Neostigmine 50mcg/kg or Sugammadex were administered on TOF >2. The time taken to achieve TOF of 0.9, PACU time and any side effects were recorded.

Results: The mean SD time of recovery of TOF of 0.9 in Neostigmine and Sugammadex were 11.62 ± 2.32 and 5.11 ± 2.08 respectively. The recovery room discharge time was not significant in any of the groups. Side effects profile includes dryness of mouth in all cases, nausea and vomiting in 5 out of 8 cases in Neostigmine group. Overall there were no serious side effects in either group.

Conclusion: this study shows that using TIVA anaesthesia, Sugammadex is significantly more effective than neostigmine for recovery from rocuronium neuromuscular blockade without major adverse effects.

Keywords: Anaphylaxis; Endoscopic Sinus Surgery; Neostigmine; Theatre Time; Sugammadex

Introduction

There is concern about the risk of residual Neuromuscular Blockade (NMB) in airway surgery, which may lead to post-operative airway obstruction, hypoxia and mortality [1]. The studies on comparison of neostigmine vs sugammadex specifically in airway surgery alone are scarce [2,3]. Only one study compared these two drugs in paediatric airway surgery and found no difference in adverse effects [2]. Another study was an audit on sugammadex use in airway surgery in an ambulatory setting, which examined only the theatre exit time and not side effects

[3]. The prevalence of a Train-of-Four (TOF) ratio of less than 0.9 found in the postoperative recovery unit ranges from 3.5% up to 83% [4]. Incidence of residual NMB is variable, generally around 20-50% [5]. Faster and complete recovery is necessary to reduce the risk of airway obstruction, aspiration and hypoxia. Neostigmine has been used for decades as a reversible agent, with some muscarinic side effects. Sugammadex has been used recently for rapid reversal of rocuronium and similar agents with few side effects and reduction in residual neuromuscular blockade [6]. A recent systematic review comparing sugammadex and neostigmine for antagonism of NMB showed no difference in the incidence of critical respiratory events [7]. In another study sugammadex has shown benefits of recovery faster than neostigmine [8]. The impact

of airway surgery on impairment of pharyngeal muscle function, hypoxic ventilatory drive and decreased respiratory function in the immediate postoperative period can be enormous. Sugammadex drug was available recently at our institute. Since there weren't any major studies comparing its use in airway surgery in adults, this observation study was considered. The aims of the study were using these reversal agents in Functional Endoscopic Sinus Surgery (FESS) to compare their reversal time and side effects encountered.

Methods

This is an observational study for FESS in which alternate patients randomised to receive either Neostigmine or Sugammadex. After permission to conduct the study, all patients had informed consent to participate in it. Only elective FESS surgery patients between the ages of 18-70 with ASA class I-III, under general anaesthesia requiring intubation were considered. Patients with allergies to narcotics, muscle relaxants, renal dysfunction or neuromuscular disorders were excluded. Apart from standard monitoring, BIS monitors and temperature monitoring were used. The General anaesthetic was standardised to receive total intravenous anaesthesia using Propofol and Remifentanil TCI and Rocuronium. Local anaesthetic was injected at the surgical site by surgeon hence no other intraoperative long acting opioids were used. Train of four of <2 was maintained by the use of nerve stimulator Fisher & Paykel (Auckland NZ) till the end of the procedure. Towards the end of procedure when $TOF > 2$, Neostigmine 50 μ g/kg and Glycopyrrolate 10 μ g/kg in Neostigmine group and Sugammadex 2mg/Kg in Sugammadex group were administered. The time taken to achieve TOF ratio of 0.9 for extubation was recorded. Also in Post Anaesthesia Care Unit (PACU) any side effects and PACU time were recorded. For constant variants mean \pm standard deviation was used and for the categorical variants a number of cases and percentages (%) were used.

Results

There were 10 patients in Sugammadex group and 8 in Neostigmine group. One patient in Sugammadex group was excluded as the drug was not administered (missed) hence only 9 patients were considered for analysis. (Table 1).

	Sugammadex	Neostigmine
Age (mean)	40.66	38.2
Gender M/F (n)	6/3	5/3
ASA I, II, III (n)	3,4,2	0,6,2
TOF (0.9) time	5.11 \pm 2.08	11.62 \pm 2.32
PACU (min)	41.62	47.12
Nausea	0	5/8 (60%)
Dryness of mouth	9 (100%)	8 (100%)

Erythema	1(11.1%)	1(12.5%)
Desaturation	0	1(12.5%)
Breathing difficulty	0	1(12.5%)

(TOF)= train-of-four, (PACU) post anaesthesia care unit time

Table 1: Showing basic Demographics, TOF time and side effects.

Shows demographics, TOF time, PACU time and side effects. The mean SD time of recovery of TOF of 0.9 in Neostigmine and Sugammadex were 11.62 \pm 2.32 and 5.11 \pm 2.08 respectively. This indicates Sugammadex is more than two times faster in efficacy. The PACU room discharge time was not significant in any of the groups. Side effects profile includes dryness of mouth in all cases, nausea and vomiting in 5 out of 8 cases in Neostigmine group. Erythema was equally seen in both groups. There was one case of desaturation to 92-93% in Neostigmine group but none in Sugammadex group. This desaturation event improved on deep breathing only. Overall there were no serious respiratory side effects in either group and no difference in fulfilling discharge criteria.

Discussion

Our results showed the Sugammadex group achieved early recovery of TOF 0.9. This didn't have much impact on the PACU time. The reduced geometric mean time to TOFR 0.9 was also demonstrated in another trial [9]. Reduced recovery time from NMB may have an impact on the potential theatre time and thus improve the productivity, as a result one additional case could be added to that theatre session. This potential economic benefit has been suggested by Paton et al for efficient theatre list management [9]. In regard to the side effects profile in the recovery there were more in the Neostigmine group. This may be anticipated with the use of anticholinergic to counter act the side effects of neostigmine. Sugammadex is a cyclodextrin with a high affinity to rocuronium and other amino-steroidal NMBA that allows the rapid and complete reversal of especially rocuronium-induced neuromuscular blockade. Generally, it's safe, a systemic review reported few anaphylaxis cases [10]. The incidence of anaphylaxis associated with sugammadex was unknown; only one study quoted 0.039% based on the usage of 15,479 doses [11]. Though the side effects were more in neostigmine group, the recovery time was no different compared to the sugammadex. Our findings are consistent with a systematic review by Abad-Gurumeta [9]; however, these findings were different in a Cochrane systematic review. Limitations of this study are: it's an observational study with few confounding factors. The main factors being it is nonrandomised with small numbers which makes it unpowered. Despite these factors, it shows a few findings like fewer side effects in the sugammadex group and less airway complications. More randomised trials may be necessary to study specifically airway surgery.

Conclusion

This study shows that using TIVA anaesthesia, Sugammadex is significantly more effective than neostigmine for recovery from rocuronium neuromuscular blockade. There is potential for saving time in surgical list management. Sugammadex is also free from many of the side effects.

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