ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

Comparison of Induction and Recovery Characteristics of Propofol and Sevoflurane in Day Care Adult Tonsillectomies

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Conflict of Interest: none

Source of Support: Nil

Abstract

Background and Aim: The present study compares the induction and recovery characteristics of these two anesthetic drugs and their usefulness in ambulatory anaesthesia. The aim of the study is to compare the induction and recovery characteristics of propofol and sevoflurane by the time to loss of consciousness, induction complications, recovery times when they are used as sole induction and maintenance anaesthetic agent in adult tonsillectomies.

Materials and Method: The study was a randomized prospective study. Eighty patients undergoing tonsillectomy were selected for the study. Their age ranged from 15 to 45 years. All the patients were assessed and those with normal clinical, biochemical, radiological and haematological parameters were selected.

Results: The actual mean MAP values were generally lesser in Group P than Group S at all time points studied. The difference in the mean values of MAP at induction, Post-op and at discharge compared to the reference value at Pre-op between the two groups was observed to be statistically not significant. The distribution of Phase I recovery profile between Group P and Group S is not statistically significant (p=0.21). The distribution of Phase II recovery profile between Group P and Group S is not statistically significant (p=0.01).

Conclusion: On comparing the induction and recovery characteristics of propofol and sevoflurane in adult tonsillectomies, it was found that Induction with sevoflurane is slower and with more complications. Phase I & II recovery times were comparable between both groups.. Sevoflurane anaesthesia was associated with high PONV and postoperative pain rate which is statiscally not significant.

Key Words: anaesthesia, propofol, sevoflurane, tonsillectomies

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Introduction

Ambulatory anaesthesia is one administered for elective surgical procedure performed on carefully selected patients, which is undertaken with all its constituent elements same day. It is also referred to as day case, day care or outpatient anaesthesia and more recently office - based anaesthesia.[1] Ambulatory anaesthesia is a rapidly growing subspecialty. Although its history is as old as the history of general anaesthesia itself, it has emerged as a recognized concept and is evolving over the past couple of decades. In the US, it comprises 70 percent of anaesthesia services provided.[2]

In the UK, the NHS plan, published recently predicts that 75 percent of elective surgical procedures will soon be conducted as day cases. Anaesthetic agents today have been designed and marketed to meet specific niche criteria for ambulatory anaesthesia.[3] Among the agents available in India, propofol and sevoflurane have increased the ability of the anaesthesiologist to provide a successful day case experience. The present study compares the induction and recovery characteristics of these two anaesthetic drugs and their usefulness in ambulatory anaesthesia.[4]

The aim of the study is to compare the induction and recovery characteristics of propofol and sevoflurane by the time to loss of consciousness, induction complications, recovery times when they are used as sole induction and maintenance anaesthetic agent in adult tonsillectomies.

Materials and Methods

This study was carried out in the Government General Hospital, after obtaining ethical committee and institutional approval. The aim of the study was to compare the induction and recovery characteristics of propofol and sevoflurane when they are used as single induction and maintenance anaesthetic agent in adult day care tonsillectomies.

The study was a randomized prospective study. Eighty patients undergoing tonsillectomy were selected for the study. Their age ranged from 15 to 45 years. All the patients were assessed and those with normal clinical, biochemical, radiological and haematological parameters were selected. Informed written consent was obtained from all the patients and parents in case of minor. Each patient was randomly allocated to either the propofol or the sevoflurane group by lots. The groups were named ‘P’ for propofol and ‘S’ for sevoflurane.

Inclusion Criteria

Assessed patients of ASA physical status I & II Normal biochemical and haematological parameters Age group between 13 to 40 years No known hypersensitivity to egg or drugs Airway – MPC I & II Undergoing tonsillectomy and adenoidectomy Surgery lasting around one hour Patients normally able to ambulate well Educated attender who can understand and carryout instructions.

Exclusion Criteria

Patient not willing ASA class III and above Patients with H/O drug or egg allergy Anticipated difficult airway H/O serious adverse experience with anaesthesia Severe CVS/RS/CNS/ Metabolic disease

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

MATERIALS

1. Anesthesia machine with sevoflurane vaporizer.
2. Appropriate drugs in labeled, preloaded syringes.
3. Functioning Laryngoscope with appropriate size blades
4. Appropriate sized endotracheal tubes,
5. Equipments and drugs for resuscitation.

Methods

Preoperative preparation Patients were assessed pre-operatively. Procedure was explained to the patient and informed consent obtained. They were assessed with particular attention to any contraindications. The tests for recovery and the importance of strictly following instructions were emphasized.

The patients were not given any IM premedication. No prophylactic antiemetic was given. All the patients received Glycopyrrolate 5µg/kg and Fentanyl 2 µg/kg just before induction of anaesthesia.

On arrival of the patient in the operating room, monitors like pulse oximetry, NIBP and ECG were connected and baseline values of HR, BP and SPO2 were recorded. An intravenous access was obtained in the nondominant arm. 2% IV Lignocaine 1cc was given before induction to both the groups. Although lignocaine was given as prophylaxis against pain on injection of propofol, it was administered to both groups of patients because of possible effects on haemodynamic variables and to make it a constant.

PROPOFOL GROUP: The patients were induced with propofol 2mg/kg IV and intubated with 1.5mg/kg succinylcholine. After confirming and securing the endotracheal tube in position, they were connected to the closed circuit with nitrous oxide and oxygen in 2L: 1L ratio. Immediate post intubation, this group of patients received a continuous infusion of propofol 6-12mg/kg/hr (100-200 µg/kg/mnt) to maintain an adequate depth of anesthesia as judged by clinical signs and haemodynamic responses to surgical stimuli. Ventilation was controlled with vecuronium 0.8 mg/kg as the loading dose and one fourth of the loading dose as top up dose. They were given Diclofenac injection IM after intubation.

SEVOFLURANE GROUP The patients are induced with sevoflurane 4% by patient controlled inhalation induction i.e. spontaneous ventilation (Penlon sigma Delta vaporizer) in Nitrous Oxide and oxygen in 4L: 2L ratio and intubated with 1.5mg/kg of succinylcholine. After confirming and securing the endotracheal tube in position, they were connected to the closed circuit with nitrous oxide and oxygen in 2L: 1L ratio with sevoflurane 1-2.5% to maintain adequate depth of anaesthesia. Ventilation was controlled with vecuronium 0.8mg/kg as loading dose and one fourth of the loading dose as top up dose. This group also received Diclofenac injection 1M after intubation.

Parameters studied 1. TIME TO LOSS OF CONSCIOUSNESS Time interval from the start of induction to loss of eyelash reflex. 2. INDUCTION COMPLICATIONS 1. Desaturation 2. Coughing 3. Laryngospasm 4. Patient movement. 3. TIME TO PHASE I RECOVERY This is

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

the time taken from discontinuation of propofol or sevoflurane to the time when Aldrete score is ≥ 9. 5. TIME TO PHASE II RECOVERY This is the time taken from discontinuation of propofol or sevoflurane to the time when the PADSS score is ≥ 9. It is also taken as the time to home readiness.

Statistical analysis

The descriptive statistics of the variables studied are represented as two-way tables. The categorical factors are represented by the number and frequency (%) of cases. The differences in the properties are tested for statistical significance using non-parametric Chi-square test for variables measured on nominal scale. For variables measured on a continuous scale, when testing for two groups, Student "t" test is used to test for statistical significance in the differences of the two means.

Results

The patients included in the study were divided into two groups consisting of twenty patients each. Group P (n=40) received Propofol Anaesthesia Group S (n=40) received Sevoflurane Anesthesia. The mean age was observed to be greater in Group P than Group S but not statistically significant. A female preponderance was forthcoming in Group P and equally distributed in Group S. The difference in the distribution between the two groups is not statistically significant.

The distribution of number of cases by MPC and the two groups was not statistically significant (p=0.34) with more proportion of Grade I cases in among Group S than Group P. The actual mean MAP values were generally lesser in Group P than Group S at all time points studied. The difference in the mean values of MAP at induction, Post-op and at discharge compared to the reference value at Pre-op between the two groups was observed to be statistically not significant.

The distribution of Phase I recovery profile between Group P and Group S is not statistically significant (p=0.21). The distribution of Phase II recovery profile between Group P and Group S is not statistically significant (p=0.01).

Table 1: Distribution of cases by MPC and group

MPC	Group S	Group P	P value
Grade I	38	32	0.28
Grade II	2	8	

Table 2: Distribution of Phase I recovery by groups

Phase I recovery profile	Group S	Group P	P value
No. of cases	40	40	0.29
Mean ± SD	14 ± 3.65	15 ± 2.75	
Range	10 - 20	10 - 20	

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

Table 3: Distribution of Phase II recovery by groups

Phase II recovery profile	Group S	Group P	P value
No. of cases	40	40	0.19
Mean ± SD	100 ± 13.45	108 ± 16.65	
Range	80 - 150	80 - 170	

Discussion

Intravenous agents are used commonly for induction of anaesthesia followed by inhalational agents for maintenance. A problem with this technique is the transition phase from induction to maintenance. The rapid redistribution of the intravenous agent could lead to lightening of anaesthesia before an adequate depth is attained with the inhalational agent.[5] This has promoted the rediscovery of 'single agent' anaesthesia, which avoids problems associated with a transition phase.[5, 6]

Propofol is a short acting general anaesthetic agent used widely for total intravenous anaesthesia because of its favorable recovery profile and low incidence of side effects.[7] Propofol infusions are also becoming increasingly popular for maintenance of anaesthesia. However, use of propofol is associated with pain on injection, cardiovascular and respiratory depression and requires an intravenous drug delivery system.[8]

Sevoflurane is a safe and versatile inhalational anaesthetic compared with currently available agents. Sevoflurane is useful in adults and children for both induction and maintenance of anaesthesia in inpatient and outpatient surgery.[9] Of all currently used anaesthetics, the physical, pharmacodynamic, and pharmacokinetic properties of sevoflurane come closest to that of the ideal anaesthetic.[10]

Anton A. et al in their audit on preoperative patient preferences for induction of anaesthesia in adults found that 33% selected IV induction, 50% chose inhaled induction and 17% patients were undecided. They conclude that where manpower and facilities permit and in the absence of risk of regurgitation or airway difficulty, it is suggested that enquiry may be made of healthy adults presenting for elective ambulatory surgery as to their preferred route for the induction of anaesthesia.[11]

The inhalation induction done in our study was based on the above study.[12] A. Thwaites, S. Edmends and I. Smith in their study of inhalation induction with sevoflurane versus intravenous induction with propofol conclude that induction of anaesthesia with sevoflurane was significantly slower compared with propofol, but was associated with a lower incidence of apnoea and a shorter time to establish spontaneous ventilation.[12, 13]

Brain Fredman et al in their study of sevoflurane versus propofol was significantly faster than inhalation induction with sevoflurane and there were no significant difference in the incidence of coughing, airway irritation or laryngospasm during induction of anaesthesia. In our study, we found that induction with sevoflurane is longer and associated with more complications.[14] This is in concurrence with the study done by W. Scott Jellish et al comparing the induction and

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

maintenance of anaesthesia in adult patients with sevoflurane and propofol. They found that induction of anaesthesia is shorter with propofol. This explains the more incidence of bronchospasm observed in the sevoflurane group. The patient movement during intubation were slight movements of the hands or feet and did not compromise tracheal intubation or haemodynamics.[15]

Both propofol and sevoflurane produce dose dependent depression of ventilation and produce apnoea. Opioids given as premedication enhance this ventilatory depressant effort. This explains the increased incidence of apnoea observed in both groups. Though MAP decreased during induction of anaesthesia in both groups, the fall in MAP is more with induction of anaesthesia with propofol. The occurrence of bradycardia in one patient during induction of anaesthesia with sevoflurane could be explained by the direct sevoflurane induced inhibition of the betaadrenoceptor system. Though statistically not significant, phase I recovery i.e. emergence from anaesthesia is shorter with sevoflurane than with propofol. This is in concurrence with the study done by A. Thwaites et al. In our study, we found that the phase II recovery time after induction and maintenance of anaesthesia with propofol and sevoflurane were comparable. But the incidence of postoperative nausea and vomiting is more with sevoflurane anaesthesia and the number of patients complaining pain were more with sevoflurane anaesthesia.

Conclusion

On comparing the induction and recovery characteristics of propofol and sevoflurane in adult tonsillectomies, it was found that Induction with sevoflurane is slower and with more complications. Phase I & II recovery times were comparable between both groups. • Sevoflurane anaesthesia was associated with high PONV and postoperative pain rate which is statiscally not significant.

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ISSN: 0975-3583, 0976-2833 VOL14, ISSUE01, 2023

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