Original Article

COMPARISON OF EMERGENCE TIME AFTER TOTAL INTRAVENOUS ANAESTHESIA VERSUS INHALATIONAL ANAESTHESIA IN GYNAECOLOGICAL PROCEDURES

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ABSTRACT

Objectives: To compare emergence time after Total Intra-venous Anesthesia (TIVA) using Propofol and Inhalational Anesthesia using Sevoflurane in minor gynecological and obstetric procedures.

Study Design: Randomized controlled study.

***Place and Duration of Study*:** Department of Anesthesiology, Intensive Care and Pain Management, Combined Military Hospital, Peshawar. Six months from 15th March 2010 to 14th September 2010.

Patients and Methods: A total of 200 gynecological patients of ASA-I and II were included in this study. Patients were divided randomly in 2 groups of 100 each using random numbers table. Group A patients were administered TIVA- Propofol and group B patients were given inhalational anaesthesia using Sevoflurane. A stopwatch was started when the anesthetic drug was discontinued at the end of surgery and was stopped as soon as the patient opened her eyes spontaneously to record the emergence time. All the data was entered in a patient performa.

Results: It was observed that group A patients who were administered Propofol had a faster emergence time as compared to group B patients who were administered Sevoflurane. The mean emergence time of TIVA- Propofol group was 6.24 minutes (SD=0.726) while that of inhalational- Sevoflurane group was 8.52 minutes (SD=1.218). The shorter emergence time of Propofol group was highly significant when compared with the Sevoflurane group (p<0.001).

Conclusion: The study concluded that Propofol provides rapid emergence than Sevoflurane.

Keywords: Sevoflurane, Propofol, Emergence time.

INTRODUCTION

General anaesthesia has routinely been administered using intra-venous or inhaled volatile anaesthetics[1]. Amongst the available intra-venous and inhalational agents Propofol and Sevoflurane provide the most rapid induction and recovery profiles. Historically, during the last 30 years the introduction of short acting hypnotic agents like Propofol has developed Total Intra-Venous Anaesthesia (TIVA) as a newer and safer means of providing general anaesthesia. Similarly, Sevoflurane although first synthesized in 1968 but not available for clinical use until early nineties, has proved to be an excellent choice for rapid induction and quick post-operative emergence.

In current practice, both Propofol for TIVA and Sevoflurane for inhalational anaesthesia continue to be frequently administered because of their pharmacological properties of providing fast recovery and emergence after general anaesthesia[2]. Preference in use of either agent in daily practice continues to be based on tradition, consideration of cost or clinical impression of anaesthesiologists rather than on trial evidence[1]. Clear indications of superiority of one method over the other are lacking with respect to criteria such as emergence time, extubation time, post-operative cognitive levels, post-operative pain and cost involved.

Propofol is an intravenous induction agent that provides rapid induction, abolishes airway reflexes and has the maximum intrinsic

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anti-emetic property amongst all induction agents. Its rapid termination of effect is by redistribution and not by biotransformation or breakdown. The distribution half life is 2-4 minutes and the elimination half life is 1-3 hours.

Sevoflurane as an inhalational anaesthetic is considered superior to other agents as it is non-irritant to the airways like Isoflurane and Desflurane and does not cause profound cardiac depression like Halothane. Its sweet odour makes it a drug of choice for inhalational induction. Sevoflurane exhibits a low blood gas partition coefficient which is associated with both a rapid induction of anaesthesia and quick emergence[3].

In studies that have been conducted so far in various parts of the world, there exists considerable controversy regarding the emergence and recovery time after TIVA and inhalational anaesthesia.

Some studies have shown that TIVA despite being associated with the highest intra-operative cost, provided the most rapid recovery and had the least post-operative side effects like nausea, vomiting, agitation and somnolence that are associated with Sevoflurane anaesthesia. This means that lower cost and fewer additional drugs are required in post anaesthesia care unit once TIVA is used[4-6]. Other comparative studies have shown that patients showed faster recovery after inhalational anaesthesia as compared to TIVA[7,8]. Still other studies suggest that there exists no difference in emergence time and early return of cognitive functions between Propofol and Sevoflurane[9].

In our settings, this comparative study was carried using Propofol for TIVA and Sevoflurane for inhalational anaesthesia in short (less than 30 minutes duration) surgical procedures of gynaecology and obstetrics. Our study was designed to compare whether Propofol or Sevoflurane had a shorter emergence time in our population.

PATIENTS AND METHODS

This quasi-experimental study was carried out in Department of Anaesthesia, Intensive care and Pain management CMH Peshawar from 15th March 2010 to 14th September 2010. Two hundred patients of ASA I and II undergoing gynaecological and obstetric surgeries of less than 30 minutes were included in this study. They were divided randomly into 2 groups of 100 each using random numbers table. Group A included patients who were administered TIVA-Propofol and Group B included those patients who were given inhalational anaesthesia using Sevoflurane. The source of patients was both indoor patients and day cases undergoing planned minor gynaecological and obstetric surgeries of less than thirty minutes at Combined Military Hospital, Peshawar. Informed written consent was taken from each patient. Prior permission was also taken from the hospital ethical committee and all ethical issues were addressed. Pre-operative anaesthesia assessment was carried out one day prior to the planned surgery for all patients.

Patients were asked to remain nil per oral at least 6 hours prior to the surgery. All patients were pre-medicated with intra-venous Midazolam 0.05 mg/kg body weight one hour before induction of anaesthesia. Patients were then shifted to the main operating room where standard monitoring comprising NIBP, pulse oximetry, capnography and ECG was attached. Electrodes for Bispectral index analysis (BIS) were also attached. All patients were pre-oxygenated for three minutes. Intra-venous Propofol (2 mg/kg) was used for induction in group A and inhalational Sevoflurane @ 8% was used to induce anaesthesia in group B patients. All the patients were initially ventilated through a face mask. An appropriate sized Laryngeal Mask Airway (LMA) was placed once adequate depth of anaesthesia (BIS 45-65) was achieved in patients of both groups. Oxygen and nitrous oxide were given in 50% concentrations.

Maintenance regimens were started once a LMA had been placed. For group A patients

Propofol maintenance was done through a syringe pump using a multi-step infusion regimen. The initial infusion regimen was @ 10 mg/kg/hr for 10 minutes, then 8 mg/kg/hr for the next 10 minutes and thereafter the maintenance infusion rate was 6 mg/kg/hr. For group B patients Sevoflurane maintenance was done through a vaporizer set between 3 and 5 percent, adjusted according to the haemodynamic response of the patient as well as ensuring adequate depth of anaesthesia (BIS 45-65). A gas analyzer was used to monitor the amount of Sevoflurane delivered. Intra-venous Fentanyl (2 µg/ kg body weight) due to its hemodynamic stability and least residual effect amongst narcotic analgesics was used for peri-operative analgesia. A BIS between 45-65 was maintained for ensuring adequate anaesthetic depth for both patient groups throughout the procedure.

Duration of surgery and emergence time was recorded by anaesthesiologist in-charge of the patient. A stopwatch was started as soon as the anaesthetic drug (Propofol or Sevoflurane) was begun and stopped when the anaesthetic drug was discontinued to record the duration of surgery. A second stopwatch was started when the anaesthetic drug was discontinued and was stopped as soon as the patient opened her eyes spontaneously to record the emergence time.

Data had been analyzed using SPSS version 15. Descriptive statistics were used to describe the data i.e mean and standard deviation (SD) for quantative variables while frequency along with percentage for qualitative variables. Independent sample t-test was used for comparison of age and emergence time while chi square test was used for the comparison oa ASA classification between both the groups. $p<0.05$ was considered level of significance.

RESULTS

In our study all the cases included were females. The age of the patients ranged from 25–45 years.

Patients were also classified according to ASA classification in which 132 patients were classified as ASA–I and 68 patients as ASA–II both the groups were comparable with respect to age ($p>0.05$) and ASA classification ($p>0.05$).

The mean emergence time of TIVA- Propofol group was 6.24 minutes (SD=0.726) while that of Inhalation - Sevoflurane group was 8.52 minutes (SD=1.218).

Significantly shorter emergence time was observed in Propofol group as compared to the Sevoflurane group ($p<0.001$)(table-1).

DISCUSSION

Although the quest for an ideal anaesthetic agent continues and remains a dream to date, numerous drugs have been found with properties of early induction, rapid emergence, clear headed recovery along with other intrinsic advantages like analgesia, sedation and anti-emesis. Due to this progress, day case surgery has become acceptable and preferred specially in minor procedures in ASA I and II patients.

Acute shortage of hospital resources like manpower, beds and medicines as well as limited hospital funds and large waiting lists of patients planned for elective surgeries requires minimum possible operation theatre and hospital stays. Nowadays, day case surgeries have to be performed routinely and usage of anaesthetic agents with most rapid emergence and least residual effects has become the standard.

Propofol, a phenol derivative, is an anaesthetic agent which is being utilized for total intra-venous anaesthesia (TIVA). It provides rapid induction and emergence, abolishes airway reflexes and has anti-emetic properties. It provides a clear headed recovery with little residual effects[10]. Sevoflurane is an alternative induction agent to Propofol. Due to its pleasant smell, non-irritation of the airways, easy titration and rapid induction and emergence it is being increasingly used to provide anaesthesia in day care surgeries[11].

This study aimed on finding a sole anesthetic agent that has the most rapid emergence in our population so that it can be used routinely. Presently, Sevoflurane for inhalational anaesthesia and Propofol for TIVA are used most commonly for this purpose[11]. Preference is usually anaesthesiologist dependant[3]. Although, considerable research has been done in this regard but conflicting and varied views are prevalent regarding the emergence time of these two agents.

Table-1: Comparison of baseline characterstics and emergence time between both groups.

	Group A (n=100)	Group B (n=100)	*p*-values
Age (years)	33 ± 6.21	32.3 ± 5.91	>0.05
ASA Status: ASA I ASA II	68(68%) 32(32%)	64(64%) 36(36%)	>0.05
Emergence time (min)	6.24 ± 0.73	8.52 ± 1.22	>0.001

Falsini and colleagues conducted a comparative study of Sevoflurane and Propofol. They concluded that emergence time as well as recovery was significantly faster in case of Sevoflurane. It was also seen that no significant differences in postoperative adverse effects and laboratory tests existed in both groups of anaesthetics[12].

The study conducted by Peduto et al also yielded similar results and led them to conclude that anaesthesia with Sevoflurane produces faster emergence and recovery than Propofol plus Fentanyl after anaesthesia of short to intermediate duration[13].

On the contrary, Hong et al in their article "Anaesthesia for day case excisional breast biopsy: Propofol-Remifentanil compared with Sevoflurane-Nitrous oxide" concluded that although smoother inductions were seen with Sevoflurane but Propofol showed a quicker emergence with less nausea/vomiting[14].

The discussion gets even more confusing because in other articles like "Clinical comparison of 'single agent' anaesthesia with Sevoflurane versus target controlled infusion of Propofol" written by Watson et al emergence time, postoperative nausea, vomiting and pain were unaffected by the anaesthetic technique used[15].

Also in children, studies have been conducted comparing both the agents. Sevoflurane was found to be associated with a more rapid emergence as compared with Propofol as concluded by Halem et al[16]. It also offers the advantage that anaesthesia can be induced without prior cannulation which is of prime benefit in children. However, emergence complications like agitation, somnolence and vomiting also occur more frequently with Sevoflurane anesthesia. Tang et al also compared the recovery characteristics and emergence of Propofol and Sevoflurane in pediatric patients and found that Propofol anesthesia provided slower emergence and less agitation than Sevoflurane anaesthesia[17].

On the contrary, as seen by other researchers it was also observed that early recovery and less incidences of headache and post-operative nausea and vomiting were in favor of Propofol compared with inhalational anaesthesia[5,18].

As a result of our study, it has been seen that Propofol has a clearly shorter emergence time in our population as compared to Sevoflurane and this is comparable to many of the studies mentioned above.

The significance of our study was that the drug with the shorter emergence time (Propofol) can now be used routinely in patients who are undergoing short procedures specially those who are planned as day case surgeries. As a result, the stay in the operating room, recovery area and subsequently in the hospital would be minimized. Consequently, there would be a decreased burden on the over-stretched hospital

resources specifically manpower, time, space and finances. The total time saved can now be better utilized for more surgeries to be performed in the operation theatres reducing the backlog of waiting patients. The data obtained from this study can also be extrapolated for non-gynaecological procedures and also for those high-risk patients in whom the shortest possible anaesthesia duration is desired. Another advantage of using Propofol is reduced pollution of the operation theatre environment that is associated with inhalational anaesthetic agents, as most operation theatres in our country lack scavenging systems. Similarly, titrated Propofol due to its early emergence and rapid recovery can also be used to administer anaesthesia in environments outside the operation theatre such as Magnetic resonance imaging (MRI) suits, intensive care units and trauma centers for procedures like diagnostic imaging, endoscopies and examination under anaesthesia (EUA).

CONCLUSION

In terms of emergence time, it is concluded that Propofol has a significantly more rapid emergence as compared to Sevoflurane in gynaecological and obstetric procedures. There is an urgent need to utilize Propofol more frequently for short procedures and surgeries specially day case surgeries.

COMPETING INTERESTS

I declare that I have no competing financial, professional or personal interests that might have influenced the performance or presentation of this work described in this manuscript.

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