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Original research article

To study times of recovery for propofol and isoflurane during day-case procedures

[1]Dr. Jyothsna Devi M, [2]Dr. Pasham Abbaiah, [3]Dr. Sathishkumar Bopparathi, [4]Dr. Kommuri Sudha, [5]Dr. P Sreedevi

[1, 2, 3, 4]Assistant Professor, Department of Anaesthesia, Gandhi Medical College, Secunderabad, Telangana, India

[5]Professor, Department of Anaesthesia, Gandhi Medical College, Secunderabad, Telangana, India

Corresponding Author:
Dr. Kommuri Sudha

Abstract

Background and objectives: To evaluate the efficiency of propofol and isoflurane in maintaining anesthesia during day surgery. Selecting the best medication to allow the patient to leave the hospital as soon as possible.

Methods: Following institutional approval from May 2021 to April 2022, a randomised prospective study was conducted in the Department of Anaesthesia, Gandhi Medical College, Secunderabad, Telangana, India, to determine which medication is most effective for enabling the patient to resume normal activities as soon as possible after anaesthesia maintenance with either propofol or isoflurane for day case procedures.

Results: The 24 patients in groups PRO and ISO had mean ages of 27.6 and 29.7, respectively. Patients in the PRO group had a mean weight of 48.20, whereas those in the ISO group had a mean weight of 53.43. Ten men and fourteen women made up group ISO, while nine men and fifteen women made up group PRO. The Phase I recovery times for groups PRO and ISO were 11.9 and 13 minutes, respectively. The recovery times for Phase II for groups PRO and ISO were 31.45 and 61 minutes, respectively.

Conclusion: The recovery time was accelerated by propofol alone, but in Phase I, both groups made similar progress. Comparing Propofol TIVA to Isoflurane maintenance anesthesia, phase II recovery time was significantly reduced. In comparison to isoflurane maintenance, which is preferred for day case procedures, TIVA with propofol results in an earlier Home Readiness.

Keywords: Medication, propofol, isoflurane, anaesthesia

Introduction

Outpatient surgery is becoming more and more common for social and financial reasons. An efficient induction, optimal operating conditions, and quick recovery with few postoperative complications are all duties of the anesthetis, propofol, a hindered phenol, is a reliable induction agent for outpatient anesthesia [1, 2].

In order to provide new methods of anesthesia care for this patient population, day case surgery has grown tremendously. For patients to be able to be safely and promptly discharged, it is essential to be able to administer general anesthesia safely, effectively, with few side effects, and quickly [3]. For day-case patients, the ideal anesthetic should result in a quick and smooth onset of action, intraoperative amnesia and analgesia, good surgical conditions, and a brief recovery period free of side effects. Even though propofol has proven to be popular for this indication, no intravenous induction agent has been accepted by everyone.

The administration of general, regional, and local anesthesia as well as monitored anesthesia care with sedation may be necessary for daycare (ambulatory) anesthesia surgeries. The development of daycare surgery has largely been facilitated by improvements in anesthesia methods and the accessibility of newer medications [4]. However, offering daycare anesthesia services is a difficult task. The daycare setup's logistics and organization must be well thought out in order for it to operate effectively, safely, and efficiently [5, 6, 7]. In environments where resources are scarce, these problems are accentuated [8].

Material and Methods

The Phase I and Phase II recovery times of study participants who underwent day case procedures while being sedated with either propofol or isoflurane were compared after ethical approval, and the study was conducted in the Department of Anaesthesia, Gandhi Medical College, Secunderabad, Telangana, India from May 2021 to April 2022. 48 patients with day case procedures scheduled for their head, breast, or upper limb were included in the analysis. Each individual's age ranged from 18 to 47. Patients who

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satisfied the necessary clinical, biochemical, radiological, and haematological standards were chosen from the entire group of people who underwent examination. Patients signed their consent forms after being fully informed of the benefits and risks. Patients received random doses of either propofol or isoflurane. Propofol and isoflurane were the names of the anesthetics used for the two groups, respectively.

Inclusion criteria

- Examined patients with ASA physical status levels I and II.
- According to the normal ranges for haematological and biochemical tests.
- Adults who are 18 to 50 years old.
- According to the American Safety Association, a class I and II.
- There are no records of anaphylaxis brought on by exposure to eggs or sulfa drugs.
- An airway MPC 1, 2, and 3 trifecta.
- Minor operations on the head, neck, breast, and upper limbs.
- Time of the operation was less than 90 minutes.
- Patients who are usually in sufficient physical condition to walk. Participant with education and direction-following skills.

Exclusion criteria

- Inadequate patient cooperation
- The ASA rates it as at least a class III danger.
- A well-known hypersensitivity is egg or sulphite intolerance.
- In the airway, MPC level 4
- Major procedures requiring at least one night in the hospital.
- Operations carried out on or near the windpipe.
- The said patient has mobility issues.
- Nobody showed up, or no one who could have learned anything showed up.

Methodology

Prior to the procedure Patients were evaluated in advance of the planned procedure, and informed consent was used to make sure they were aware of it and consented to it. They underwent an extensive examination to eliminate any potential risks. It was emphasized how crucial it was to carefully follow instructions and to conduct recovery evaluations. All patients received Fentanyl 2 mg as an analgesic 15 minutes prior to induction and Glycopyrrolate 5 mg as a premedication. When the patient entered the operating room, several monitoring devices were used to establish baseline values for the measurements of their heart rate (HR), blood pressure (BP), and oxygen saturation (SpO2). In this case, the non-dominant arm of the patient was used to gain intravenous access.

To induce sleep, the same intravenous propofol dose of 2 mg/Kg was administered to both groups. The right size laryngeal mask airway was correctly positioned. There were no sedatives used. Propofol was injected in a 0.5 mg/Kg bolus in case the patient moved.

Propofol (PRO) group: Patients received a continuous propofol infusion using a syringe pump right after being induced. This system is (B Braun Melsungen "S" series):

- 12 mg/kg/h x 10 min (200 mcg/kg/min)
- 10 mg/kg/h multiplied by 20 minutes (167 mcg/kg/min),
- Eight milligrammes per kilogramme per hour multiplied by one hour (one hundred thirty-three micrograms per kilogramme per minute).
- Normal maintenance dose is 100 micrograms per kilogramme per minute (-6 mg/kg/h).
- Additionally, they had access to the Bain breathing circuit, which supplied them with 33% oxygen and 66% nitrous oxide. Throughout the entire procedure, the patient kept breathing on their own. A 20mg bolus of propofol was administered to stop any uncontrollable muscle movement.

Isoflurane (ISO) group: This group received isoflurane via the Bain breathing circuit immediately following induction in a 66% Nitrous oxide and 33% Oxygen mixture (Penlon Sigma Delta vaporiser). The amount of isoflurane was adjusted by 0.2% depending on how the patient responded. Allowing patients to breathe on their own was liberating. The concentration of isoflurane needed to increase as breathing depth did, and vice versa.

Blood oxygen saturation levels were continuously monitored until recovery throughout the procedure, along with non-invasive measurements of blood pressure, heart rate, and electrocardiogram every five minutes. After the last skin suture had been placed, the maintenance agents were stopped in both groups. We started at "time zero," that is, the moment the agent was stopped, to determine the amount of time the body would require to heal. Phase I recovery refers to the period of time it takes for the Aldrete score to drop below 9. To obtain a PADSS score of 9, you must spend the time necessary to be in Phase II recovery and house-ready. When the use of propofol or isoflurane is discontinued, this is calculated until

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the Aldrete score drops to less than 9. It is time to perform PADSS 9 when isoflurane or propofol are discontinued. Additionally, "Home readiness" time is substituted for using this period [8, 9].

Results

Two categories of 24 patients each were formed from the participants in the study. Propofol was administered as maintenance to those in Group PRO (n = 24), while isoflurane was administered to those in Group ISO (n = 24).

Table 1: Average age (in years) of the two study groups

Group	N	Mean (years)	SD	Result
Group PRO	24	27.6	6.96	NS*
Group ISO	24	29.7	10.3	

* - Not Significant

No statistically significant difference existed between the two groups in terms of age.

Table 2: Average weight (kg) for both categories

Group	N	Mean (Kg)	SD	Result
Group PRO	24	48.20	12.06	NS*
Group ISO	24	53.43	10.53	

* - Not Significant

There was no statistically significant difference in weight distribution between the two groups.

Table 3: Gender distribution in the two groups under study

Sex	Group PRO	Group ISO	Result
Male	9	10	NS*
Female	15	14	
Total	24	24	

* - Not Significant

There was no statistically significant difference between the two groups in terms of sex distribution.

Table 4: The operation's duration (min)

Group	N	Mean (min)	SD	Result
Group PRO	24	40.35	16.49	NS*
Group ISO	24	43.50	12.23	

* - Not Significant

There was no statistically significant difference in the duration of the procedure between the two groups.

Table 5: Duration of phase I recovery

Group	N	Mean (min)	SD	Result
Group PRO	24	11.9	2.89	NS*
Group ISO	24	13	2.15	

* Not significant

There was no statistically significant difference between the two groups for the duration of Phase I recovery.

Table 6: Duration of phase ii recovery

Group	N	Mean (min)	SD	Result
Group PRO	24	31.45	8.78	$p< 0.01$
Group ISO	24	61	22.69	

Significant at $p< 0.05$

Highly statistically significant at $p< 0.01$

Before "Home preparedness," there was a statistically significant difference between the two groups. Propofol took much less time to reach Phase II recovery than isoflurane did.

Discussion

The highest standards of anesthesia must be used for day surgeries, with the least amount of risk of complications, side effects, and delay in getting back to regular activities. In light of these considerations,

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choosing local or regional anesthesia as your primary pain management method might make sense. The ideal anesthetic approach has a rapid and swift induction, physiologically stable maintenance with easily adjustable anesthetic depth, and rapid and full recovery, allowing early return to regular activities, when general anesthesia is required, as it frequently is. The intravenous anesthetic propofol has a quick onset of action and is used to induce and maintain general anesthesia. The process of waking up after anaesthesia induction described here is significantly quicker and more thorough than any other method [9, 10, 11]. The stability of the laryngeal reflex under propofol anesthesia facilitates LMA placement. The Laryngeal Mask Airway has thus come to be the standard for these patients. LMA requires less anesthetic depth than tracheal intubation and almost never results in postoperative sore throat. The fact that propofol promotes a quicker return to awareness with fewer adverse effects on the central nervous system is one of its greatest benefits.

Isoflurane is an inhalant that has a very long half-life and very poor solubility in bodily tissues. It is mostly excreted through the respiratory system unchanged and goes through very little metabolization. The lungs must exhale a significant amount of isoflurane to keep the body anesthetized. Isoflurane anesthesia in humans results in a quick recovery because it is poorly soluble. When it comes to GA in day care patients, an LMA is preferred over a tracheal tube. The best airway for daycase anesthesia, according to research by Joshi *et al*. and others, is the laryngeal mask airway [11, 12, 13]. After receiving laryngeal mask anesthesia, postoperative throat discomfort was linked to the ventilation method, as discovered by Francisco Muoz-Blanco, Miguel Vivar-Diago, Eduardo Figueredo, and Eduardo Figueredo. Compared to mechanical ventilation, spontaneous breathing is much more comfortable.

In a study of patients undergoing ambulatory surgery who were both medicated and unmedicated, McCrory *et al*. found that only unmedicated patients experienced stomach reflux. A sufficient premedication prevented micro aspiration and reflux. We made the decision to control the study's airways using a laryngeal mask in light of the research. Only patients who underwent ambulatory surgery without taking any medication experienced stomach reflux, according to researchers McCrory, Connail R., MB, and McShane, Alan J. Taking an adequate premedication helped prevent reflux and micro aspiration. Based on the findings, we chose to use a laryngeal mask to control the study's airways. Drugs cannot stop the drop in plasma concentration when they return from tissue storage sites to the circulation due to rapid metabolic clearance, even during prolonged infusions. In contrast, because so little of it is metabolized, isoflurane is completely eliminated through the lungs when it is inhaled. Recovery is slowed by the accumulation of isoflurane in fat tissues during prolonged anesthesia. To avoid bias, the study was limited to 90-minute operations.

The most effective way to administer TIVA Propofol is through target-controlled infusions, in which a computer program calculates the plasma levels. These pumps' algorithms may not work for our patients because they were created using Caucasian patients. Manual stepwise infusions using TIVA are swift and effective. In a study by Sear, J. W., and Glen, J. B., manual stepwise Propofol infusions produced acceptable plasma levels and a painless procedure based on patient weight. In our trial, we used slow infusions [14, 15]. Some patients still required Propofol boluses to manage their uncontrollable movements after receiving progressive infusions. Propofol's TIVA recovery was quicker than that of isoflurane. The same discovery was made by Klaus Mund, Norbert Jaun, Bernhard Kumle, Martin Heck, and Joachim Boldt. Thomas J. Ebert, Brian J. Robinson, Toni D. Uhrich, Arden Mackenthun, and Philip J. Pichotta compared the recovery from propofol, isoflurane, and sevoflurane. Propofol recovered more quickly (86.4 minutes) than isoflurane.

The longer surgeries may have contributed to the longer recovery periods. Franklin Dexter and John H. Tinker concluded that propofol had positive effects. Vincent, *et al*. found no appreciable difference between the duration of Propofol and Isoflurane. Propofol had a significant impact on lowering postoperative nausea and vomiting. Propofol improved the healing process. Ashworth, Julie, and Smith, Ian discovered that the recovery times for propofol and isoflurane were comparable. Due to propofol's lipid solubility and elderly patients' higher body fat levels, both medications had identical recovery times. The isoflurane group recovered more quickly, according to research by Rowbotham *et al*. Although the level of emesis was the same, propofol and isoflurane both made patients feel sicker. According to Moffat and Cullen, you wake up more quickly from isoflurane than you do from propofol. In this study, propofol had a higher recovery rate than isoflurane [15, 16]. Even though the only factor we considered in our study was recovery time, propofol had a noticeably higher overall recovery quality.

When Propofol was used as the maintenance medication, postoperative nausea and vomiting. One of the most severe side effects of general anesthesia - did not happen. The analgesic effects of isoflurane are minimal. Because a strong opioid like fentanyl was used and the procedures were straightforward, this property of isoflurane had no bearing on the outcomes. In this analysis, the cost was an important factor that was disregarded. The study is being carried out at a government facility where patients receive free medical attention, so it will be very difficult to analyze the results [17]. The patient will not be charged for the medications. According to numerous studies, isoflurane is less expensive than propofol when comparing their prices. However, the total cost of a stay in a high-dependency facility, the cost of hiring qualified staff, and the cost of drugs used to treat PONV are not contrasted.

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Conclusion

The time required for recovery and getting ready to go home after ambulatory anesthesia with propofol as a total intravenous venous anesthesia agent was found to be shorter when compared to using isoflurane for inhalational maintenance. Phase I saw similar rates of recovery for both groups. The time needed for phase II recovery was significantly reduced when comparing Propofol TIVA to isoflurane maintenance anesthesia. For day-case procedures, TIVA with Propofol is preferable to isoflurane maintenance due to its quicker time to home readiness.

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Conflict of interest

None

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