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Propofol and isoflurane's recovery times during day- case procedures

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Abstract

Background and Objectives: To assess the effectiveness of isoflurane and propofol in preserving anaesthesia during day case surgery. Deciding on the best medication to send the patient home as soon as possible after surgery.

Methods: A randomised prospective study was carried out in the Department of Anaesthesia, Narayana Medical College, Nellore, Andhra Pradesh, India, following institutional approval, from January 2014 to October 2014, to ascertain which agent is best for making the patient street-fit as soon as possible following anaesthesia maintenance with either Propofol or Isoflurane for day case procedures.

Results: The mean ages of the 22 patients in groups PRP and ISF, respectively, were 26.5 and 28.8. The mean weight of patients in the PRP group was 47.35, whereas the ISF group's was 52.44. In group ISF, there were 9 men and 13 women, while group PRP had 8 men and 14 women. In groups PRP and ISF, the Phase I recovery time was 11.5 and 12 minutes, respectively. For groups PRP and ISF, the recovery times for Phase II were 30.65 and 60 minutes, respectively.

Conclusion: Propofol alone resulted in a quicker recovery, but during Phase I, both groups showed comparable gains. Phase II recovery time was significantly shortened with Propofol TIVA compared to Isoflurane maintenance anaesthesia. TIVA with Propofol results in an earlier Home Readiness compared to Isoflurane maintenance, which is preferred for day case procedures.

Keywords: Medication, recovery period, propofol, isoflurane, anaesthesia

Introduction

A reliable general anesthesia technique must be used on goats because they are increasingly being used as surgical models for a variety of biomedical research applications ^[1]. Typically, injectable anesthetic medications are used for both induction and maintenance of anesthesia, while inhaled medications are employed for maintenance of anesthesia ^[2]. There isn't a single ideal anesthetic agent in use today; even when there are some agents that have certain benefits, they don't have all of the ideal qualities. The intrinsic pharmacological effects of each anesthetic, the procedure type and duration, the accessibility of inhalation anesthetic equipment, the proficiency in the anesthetic technique, etc. should all be taken into consideration when choosing the best technique for anesthetic maintenance ^[3].

With the advent of more potent anesthetic medications, day surgeries gained popularity when it became clear that keeping the patient in the hospital overnight wasn't necessary. Day surgeries have advanced as a result of a number of factors, some of which are nation-specific. Due to rising medical costs in the country, health insurance was made mandatory by the government. The pressure from insurance companies forced the medical expert to think about and ultimately adopt the day surgery cost-saving strategies. Day care centers came into use when the National Health Service in the United Kingdom ran into problems and patients had to wait years for operations due to the high number of patients needing care. In India, where universal health care has not yet been put into place, both issues are present. The use of day surgery has increased and has evolved into a more advanced medical specialty ^[4, 5]. The method lowers overall costs and frees up resources to treat more patients because hospital stays are shorter for patients. Additional advantages of a shorter hospital stay include fewer nosocomial infections and less time missed by the patient and his loved ones from work or school.

Additionally, it is more appealing to both younger and older patients due to the shorter time spent away from home. The concept of ambulatory anesthesia was first put forth by Ralph Waters in the early 1900s and has since developed at an exponential rate. Although localized anesthesia was the type used initially, many patients now opt for general anesthesia. Historically, same-day surgery was not an option for general anesthesia due to the lengthy

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recovery times associated with these drugs. Due to the availability of anesthetics with shorter half-lives and improved recovery profiles, general anesthesia can now be used for day-case procedures [6, 7, 8]. Due to the "clear headedness" of recovery, patients are permitted to leave the hospital just a few hours after surgery. When using this technique, the anesthetics propofol and isoflurane have both shown to be very beneficial. In this study, we compare the recovery profiles and outpatient setting efficacy of the two medications.

Material and Methods

Following ethical approval, this randomised prospective study was carried out in the Department of Anaesthesia, Narayana Medical College, Nellore, Andhra Pradesh, India, from January 2014 to October 2014. Phase I and Phase II recovery times of study participants who underwent day case procedures while under anaesthesia with either propofol or isoflurane were compared. The analysis included 40 patients who had day case procedures planned for their head, breast, or upper limb. The ages of each person ranged from 18 to 47. From the entire group of people who underwent examination, patients were selected who met the required clinical, biochemical, radiological, and haematological standards. After receiving a complete explanation of the risks and advantages, patients signed their agreement. Either propofol or isoflurane was given to patients at random. The two groups' respective anesthetics were designated by the names propofol and isoflurane.

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

Before the operation Prior to the planned procedure, patients

were assessed, and informed consent was used to ensure that they were aware of it and agreed to it. To rule out any potential risks, they underwent a thorough examination. The importance of carefully adhering to instructions was emphasized, as well as recovery evaluations. All patients received Glycopyrrolate 5 mg as a premedication 15 minutes prior to induction and Fentanyl 2 mg as an analgesic. Several monitoring devices were used to establish baseline values for the patient's heart rate (HR), blood pressure (BP), and oxygen saturation (SpO₂) measurements as soon as they entered the operating room. To obtain intravenous access in this instance, the patient's non-dominant arm was used.

Both groups received the same 2 mg/Kg intravenous propofol dose to induce sleep. A Laryngeal Mask Airway of the appropriate size was positioned correctly. No sedatives were applied. In the event that the patient moved, a 0.5 mg/Kg bolus of propofol was given.

PROPOFOL (PRP) GROUP: Following induction, patients were immediately given a continuous infusion of propofol using a syringe pump.(B Braun Melsungen "S" series) utilizing this system:

- 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).
- They were additionally connected to the Bain breathing circuit, which provided them with 66% nitrous oxide and 33% oxygen. The patient continued to breathe on his or her own throughout the entire procedure. To stop any uncontrollable muscle activity, a 20mg bolus of propofol was given.

Isoflurane (ISF) Group: Immediately after induction, this group received Isoflurane via the Bain breathing circuit in a 66% Nitrous oxide and 33% Oxygen mixture (Penlon Sigma Delta vaporiser). The percentage of isoflurane was titrated up or down by 0.2% in response to the patient's response. gave patients freedom to breathe on their own. When breathing depth increased, the isoflurane concentration needed to increase as well, and vice versa.

Throughout the procedure, non-invasive blood pressure, heart rate, and electrocardiogram monitoring were done every five minutes, and blood oxygen saturation levels were monitored continuously until recovery. Both groups' maintenance agents were stopped after the last skin suture had been applied. When calculating the time it would take for the body to heal, we began at "time zero," or the instant the agent was stopped. The duration it takes for the Aldrete score to fall under 9 is referred to as phase I recovery. Time to Phase II recovery and home-ready is the period of time required to reach a PADSS score of 9. This is calculated from the moment propofol or isoflurane is stopped until the Aldrete score falls to less than 9. When isoflurane or propofol is stopped, it is time to PADSS 9. It is additionally used as a stand-in for "Home readiness" time [8, 9].

Results

Out of those who were included in the study, two categories of 22 patients each were formed. Those in Group PRP (n = 22) received propofol as maintenance, whereas those in Group ISF (n = 22) received isoflurane.

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

Group	N	Mean(years)	SD	Result
Group PRP	25	26.5	6.96	NS*
Group ISF	25	28.8	10.3	

* - Not Significant

Regarding age, there was no statistically significant difference between the two groups.

Table 2: Average weight (kg) for both categories

Group	N	Mean (Kg)	SD	Result
Group PRP	22	47.35	12.06	NS*
Group ISF	22	52.44	10.53	

* - Not Significant

Regarding weight distribution, there was no statistically significant difference between the two groups.

Table 3: Gender distribution in the two groups under study

Sex	Group PRP	Group ISF	Result
Male	8	9	NS*
Female	14	13	
Total	22	22	

* - Not Significant

Regarding sex distribution, there was no statistically significant difference between the two groups.

Table 4: The operation's duration (mins)

Group	N	Mean (mins)	SD	Result
Group PRP	22	39.55	16.49	NS*
Group ISF	22	42.40	12.23	

* - Not Significant

Between the two groups, there was no statistically significant difference in the length of the procedure.

Table 5: Duration of phase i recovery

Group	N	Mean (mins)	SD	Result
Group PRP	22	11.5	2.89	NS*
Group ISF	22	12	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 (mins)	SD	Result
Group PRP	22	30.65	8.78	P < 0.01
Group ISF	22	60	22.69	

Significant at $P < 0.05$

Highly Statistically significant at $p < 0.01$

There was a statistically significant difference between the two groups in the time before "Home preparedness." The time until Phase II recovery was much quicker with propofol than it was with isoflurane.

Discussion

Anaesthesia for day surgery must meet the highest standards possible, with the least amount of potential for complications, side effects, and delay in returning to normal activity. Given these factors, opting for local or regional anesthesia as a primary pain relief technique might make sense. When general anesthesia is required, as it frequently is, 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. Propofol is a quick-acting intravenous anesthetic that is used for both inducing and maintaining general anesthesia. This method is significantly quicker and more thorough than any other method of waking up after anaesthesia induction [9, 10, 11].

LMA placement is made easier by the stability of the laryngeal reflex during propofol anesthesia. Because of this, the Laryngeal Mask Airway has become the norm for these patients. When compared to tracheal intubation, LMA requires less anesthetic depth and almost never causes postoperative sore throat. One of propofol's biggest advantages is that it promotes a quicker return to awareness with fewer side effects on the central nervous system. As an inhalant, isoflurane has a very long half-life and has very poor solubility in blood and bodily tissues. It undergoes very little metabolism and is mostly excreted via the respiratory system unchanged. A significant amount of isoflurane must be exhaled by the lungs in order to maintain anesthesia. Because it is poorly soluble, isoflurane anesthesia causes a rapid recovery in humans. An LMA is preferred over a tracheal tube when it comes to GA in day care patients. Research by Joshi, Girish P., Inagaki, Yoshimi, *et al.*, Molloy, Mary E., Buggy, Donal J., Scanlon, Patrick, and others has found that the laryngeal mask airway is the best airway for daycase anesthesia [11, 12, 13]. Francisco Muoz-Blanco, Miguel Vivar-Diago, Eduardo Figueredo, and Eduardo Figueredo discovered that postoperative throat discomfort following laryngeal mask anesthesia was related to the ventilation technique. Spontaneous breathing is much more comfortable than mechanical ventilation.

McCrary, Connail R., MB and McShane, Alan J. demonstrated that only unmedicated patients experienced stomach reflux in a study of medicated and unmedicated ambulatory surgery patients. Micro aspiration and reflux were prevented by a sufficient premedication. Based on the research, we decided to use a laryngeal mask to manage the study's airways. Researchers McCrary, Connail R., MB, and McShane, Alan J., found that only unmedicated ambulatory surgery patients experienced stomach reflux. Reflux and micro aspiration were avoided by taking an adequate premedication. We decided to manage the study's airways using a laryngeal mask in light of the research.

Rapid metabolic clearance ensures that drugs cannot stop the fall in plasma concentration even during prolonged infusions when they return from tissue storage sites to the circulation. Isoflurane is completely eliminated through the lungs when it is inhaled, in contrast, because so little of it is metabolized. The accumulation of isoflurane in fat tissues during prolonged anesthesia slows recovery. We kept the study to 90-minute operations to prevent bias. The best administration method for TIVA Propofol is target-controlled infusions, in which software calculates plasma levels. The algorithms for these pumps were developed using Caucasian patients; as a result, they might not work for our patients. TIVA manual stepwise infusions are quick and efficient. According to patient weight, manual stepwise Propofol infusions produced acceptable plasma levels and a seamless procedure in a study by Sear, J. W., and Glen, J. B. We used slow infusions in our trial [14, 15].

Even after receiving progressive infusions, some patients still required Propofol boluses to control their uncontrollable movements. Isoflurane TIVA recovery took longer than that of propofol. Klaus Mund, Norbert Jaun, Bernhard Kumle, Martin Heck, and Joachim Boldt also made the same discovery. Propofol, isoflurane, and sevoflurane recovery were compared by Thomas J. Ebert, Brian J. Robinson, Toni D. Uhrich, Arden

Mackenthun, and Philip J. Pichotta. Compared to isoflurane, propofol recovered more quickly (86.4 minutes). The longer recovery times could be attributed to the longer surgeries. Propofol was beneficial, according to Franklin Dexter and John H. Tinker. The duration of Propofol and Isoflurane did not differ significantly, according to Vincent, Robert D., Jr. Syrop, Craig H., VanVoorhis, Bradley J., Chestnut, David H., Sparks, Amy E.T., McGrath, Joan M., and Choi, Won W. Postoperative nausea and vomiting were significantly reduced by propofol. Recovery was enhanced by propofol. The recovery times for propofol and isoflurane were found to be comparable by Ashworth, Julie, and Smith, Ian. Both medications had identical recovery times due to the lipid solubility of propofol and the increased body fat in elderly patients. According to research by Rowbotham, D. J., Peacock, J. E., Jones, R. M., Speedy, H. M., Sneyd, J. R., Morris, R. W., Nolan, J. P., Jolliffe, and Lang, the isoflurane group recovered more quickly. Propofol and isoflurane both caused more nausea, but the level of emesis was the same. You wake up more quickly from isoflurane than you do from propofol, according to Moffat and Cullen. Isoflurane had a lower recovery rate in this study than did propofol ^[15,16].

Propofol had significantly better recovery quality overall even though the only thing we looked at in our study was how long it took to recover. Postoperative nausea and vomiting, one of the most severe side effects of general anesthesia, did not occur when Propofol was used as the maintenance medication. Isoflurane has negligible analgesic properties. This property of isoflurane had no effect on the results because a potent opioid like fentanyl was used, and the procedures were relatively simple. A crucial factor that was overlooked in this analysis was the cost. It will be extremely challenging to analyze the findings because the study is being conducted at a government facility where patients receive free care ^[17]. There will be no cost to the patient for the medications. Numerous studies have found that isoflurane is more affordable when compared to propofol when comparing their prices. The total cost of a stay in a high-dependency facility, the cost of qualified staff, and the cost of medications used to treat PONV are not contrasted, though.

Conclusion

When compared to using isoflurane for inhalational maintenance, it was discovered that the recovery time and preparation for going home following ambulatory anesthesia with propofol as a total intravenous venous anesthesia agent was quicker. Both groups recovered in Phase I at roughly the same rates. Comparing Propofol TIVA to Isoflurane maintenance anesthesia, phase II recovery time was significantly shortened. Faster Home Readiness from TIVA with Propofol than from Isoflurane maintenance makes it the better choice for day-case procedures.

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Conflict of interest

None

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