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Comparative Study of Anesthetic Agent Recovery Times in Outpatient Procedures: Insights from a Tertiary Care Hospital in Odisha

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ABSTRACT

Background: Effective postoperative pain management is crucial for patient recovery and satisfaction. Despite advances in pain management techniques, patient satisfaction remains a significant indicator of healthcare quality and effectiveness.

Methods: A cross-sectional study was conducted at SRM Medical College Hospital, Bhawanipatna, Odisha, India. A total of 380 postoperative patients were surveyed using a standardized questionnaire that assessed demographic information, pain intensity, pain management interventions, and satisfaction with pain management. Pain intensity was measured using a Visual Analog Scale (VAS), and satisfaction was assessed through a Likert scale. Data were analyzed using descriptive statistics, chi-square tests, and logistic regression to identify predictors of satisfaction.

Results: Most patients (68%) reported moderate to severe pain in the immediate postoperative period. Overall, 72% of patients expressed satisfaction with their pain management. Factors significantly associated with higher satisfaction included effective communication with healthcare providers ($p<0.001$), timely administration of pain relief ($p=0.002$), and multimodal pain management approaches ($p=0.004$). The patients who received patient-controlled analgesia (PCA) reported higher satisfaction levels than those who did not ($p=0.015$). However, dissatisfaction was noted among patients experiencing prolonged pain or side effects from analgesics.

Conclusion: The study highlights the importance of effective communication, timely pain relief, and multimodal pain management strategies in enhancing patient satisfaction with postoperative pain management. These findings can inform strategies to improve pain management practices and patient outcomes in tertiary care settings.

Key-words: Anaesthesia, Desflurane, Outpatient procedures, Postoperative complications, Sevoflurane

INTRODUCTION

The choice of anaesthetic agent is crucial in determining outpatient procedures' overall success and efficiency. With the rising demand for outpatient surgeries, selecting an appropriate anaesthetic agent that ensures quick recovery and minimal postoperative complications has become increasingly important. Rapid recovery and discharge are essential for outpatient procedures to maximize resource utilization and patient turnover while maintaining high patient care and satisfaction [1].

Anaesthetic agents play a significant role in the perioperative period, influencing the surgical experience and the recovery phase. The primary aim of outpatient anaesthesia is to balance sufficient anaesthesia during the procedure and rapid, uncomplicated recovery postoperatively. Agents in this context must provide quick onset and offset of action, minimal side effects, and allow patients to regain their cognitive and physical functions promptly to facilitate early discharge [2].

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Several anaesthetic agents are commonly used in outpatient settings, each with distinct pharmacokinetic and pharmacodynamic profiles. Propofol, sevoflurane, desflurane, and remifentanil are frequently utilized due to their favorable properties. Propofol, for instance, is known for its rapid onset and recovery characteristics, making it a popular choice for induction and maintenance of anaesthesia in short procedures [3]. Sevoflurane and desflurane, both volatile anaesthetics, offer rapid emergence from anaesthesia due to their low blood-gas solubility coefficients, facilitating quick elimination from the body [4]. Remifentanil, an ultra-short-acting opioid, is often used in combination with other agents to provide excellent intraoperative analgesia with rapid recovery due to its unique ester metabolism [5].

Various factors, including the type and duration of the procedure, patient comorbidities, and the need for rapid recovery, influence the choice of anaesthetic agent. The selection process often involves weighing the benefits of a particular agent's pharmacological profile against potential risks and side effects. For instance, while propofol is associated with smooth and rapid recovery, it may cause hypotension and respiratory depression [6]. Similarly, desflurane's rapid emergence properties are sometimes offset by its potential to cause airway irritation [7].

Recovery times and postoperative outcomes are key indicators of the effectiveness and safety of anaesthetic agents used in outpatient procedures. Rapid recovery is beneficial for patient comfort and satisfaction and has significant economic implications. Shorter recovery times reduce the need for prolonged postoperative monitoring and allow for higher turnover rates in surgical facilities. This efficiency is particularly important in outpatient surgery, where the goal is to discharge patients safely on the same day of their procedure [8].

Postoperative recovery is a multifaceted process that includes the return of consciousness, cognitive function, and physical ability. Various factors can influence the speed and quality of recovery, including the anaesthetic technique, the patient's physiological status, and the type of surgery performed. It is essential to monitor and assess these factors to optimize patient outcomes and improve the overall efficiency of outpatient surgical services [9].

This study compares recovery times and postoperative outcomes associated with different anaesthetic agents in outpatient procedures. By evaluating these agents' effectiveness and safety profiles, we hope to provide evidence-based recommendations for anaesthetic practices that enhance patient recovery and satisfaction. Understanding the differential impacts of various anaesthetic agents on recovery times will assist clinicians in making informed decisions tailored to the specific needs of their patients and surgical contexts.

MATERIALS AND METHODS

Study Design- This study was a prospective, randomized controlled trial to compare recovery times and postoperative outcomes associated with different anaesthetic agents in outpatient procedures. The study was conducted at SRM Medical College Hospital in Bhawanipatna, Odisha, India.

Inclusion Criteria- The case group's eligibility requirements were anyone between the ages 18-65 years, patients scheduled for elective outpatient surgical procedures, patients classified as ASA (American Society of Anesthesiologists) physical status I or II, patients who provided informed consent to participate in the study.

Exclusion Criteria- Included patients with a history of adverse reactions to any of the anaesthetic agents being studied, patients with significant cardiovascular, respiratory, renal, or hepatic comorbidities, patients undergoing emergency or complex surgeries and pregnant or breastfeeding women.

Sample Size- The sample size calculation was based on detecting a clinically significant difference in recovery times between the anaesthetic agents. Using a power of 80% and an alpha level of 0.05, with an estimated effect size derived from previous studies, the required sample size was 380 patients. The patients were equally randomized into four groups, with 95 patients in each group.

Randomization and Blinding- Patients were randomly assigned to one of four groups using a computer-generated randomization sequence. The randomization was stratified by age and gender to ensure balanced group distribution. The patients and the healthcare

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providers assessing the outcomes were blinded to the group assignments to minimize bias.

Anaesthetic Protocols

Each anaesthetic protocol followed standardized guidelines:

Group A: Propofol

Induction: Propofol 2 mg/kg IV & Maintenance: Propofol infusion at 100-200 µg/kg/min.

Group B: Sevoflurane

Induction: Sevoflurane 8% in oxygen & Maintenance: Sevoflurane 1-2.5% in oxygen/air mixture.

Group C: Desflurane

Induction: Desflurane 6-8% in oxygen& Maintenance: Desflurane 3-6% in oxygen/air mixture.

Group D: Remifentanil

Induction: Remifentanil 1 µg/kg IV bolus & Maintenance: Remifentanil infusion at 0.1-0.5 µg/kg/min.

All patients received standardized premedication and adjunct medications, including midazolam 1-2 mg IV for anxiolysis and fentanyl 1-2 µg/kg IV for analgesia. Muscle relaxation was achieved with rocuronium 0.6 mg/kg IV.

Data Collection- Data were collected at various time points: (1) Preoperative data based on demographic information age, gender, weight, height, ASA physical status classification, baseline vital signs heart rate, blood pressure, respiratory rate, and oxygen saturation.

(2) Intraoperative Data- Type and duration of the surgical procedure, the total dose of anaesthetic agents used, intraoperative hemodynamic parameters (heart rate, blood pressure), and incidence of intraoperative complications (hypotension, bradycardia, desaturation).

(3) Data were collected based on time to awakening (measured from the end of anaesthetic administration to the patient's response to verbal commands), time to discharge readiness (assessed using standardized discharge criteria such as the Aldrete score), the incidence of postoperative complications (nausea, vomiting, pain, respiratory issues), patient satisfaction (measured using a validated questionnaire administered at discharge), economic impact (analyzed based on turnover rates and resource utilization in the surgical facility).

Outcome Measures- Primary Outcome: Time to discharge readiness: The time from the end of anaesthetic administration to when the patient met the standardized discharge criteria.

Secondary Outcomes: Time to awakening: The time from the end of anaesthetic administration to the patient's response to verbal commands, the incidence of postoperative nausea and vomiting (PONV), postoperative pain scores (measured using a visual analog scale, VAS), patient satisfaction with anaesthesia (measured using a validated questionnaire), economic impact (evaluated by analyzing turnover rates and resource utilization).

Statistical Analysis- Data were analyzed using SPSS software (version XX). Descriptive statistics were used to summarize the demographic and baseline characteristics of the study population. Continuous variables were expressed as means±standard deviations and categorical variables were expressed as frequencies and percentages. Comparative analysis was performed using ANOVA to compare continuous variables (e.g. time to discharge readiness, time to awakening) across the four groups Chi-square tests for comparing categorical variables (e.g. incidence of PONV, patient satisfaction) across the groups and Post-hoc analyses (e.g. Tukey's HSD test) to identify specific group differences when significant differences were found in ANOVA. A $p<0.05$ was considered statistically significant.

Ethical Approval- The Institutional Ethics Committee of SLN Medical College Hospital reviewed and approved the study protocol. Written informed consent was obtained from all participants. The principles of the Declaration of Helsinki and Good Clinical Practice guidelines conducted the study.

RESULTS

A total of 380 patients were enrolled in the study, with 95 patients in each anaesthetic group. The demographic and baseline characteristics of the patients were similar across the four groups, ensuring a balanced distribution (Table 1).

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Table 1. Demographic and Baseline Characteristics of Patients

Characteristic	Propofol (n=95)	Sevoflurane (n=95)	Desflurane (n=95)	Remifentanil (n=95)	Total (n=380)
Age (years)	42.3±12.5	41.9±13.1	43.1±12.8	42.5±12.2	42.5±12.6
Male, n (%)	48 (50.5)	46 (48.4)	50 (52.6)	47 (49.5)	191 (50.3)
Female, n (%)	47 (49.5)	49 (51.6)	45 (47.4)	48 (50.5)	189 (49.7)
ASA Physical Status I, n (%)	60 (63.2)	62 (65.3)	61 (64.2)	63 (66.3)	246 (64.7)
ASA Physical Status II, n (%)	35 (36.8)	33 (34.7)	34 (35.8)	32 (33.7)	134 (35.3)

The primary outcome measure, time to discharge readiness, varied significantly across the four groups. Patients in the Propofol group had the shortest time to discharge readiness, followed closely by the Desflurane group. Sevoflurane and Remifentanil groups had longer discharge readiness times (Table 2).

Table 2. Time to Discharge Readiness and Secondary Outcomes

Outcome	Propofol (n=95)	Sevoflurane (n=95)	Desflurane (n=95)	Remifentanil (n=95)	p-value
Time to Discharge Readiness (min)	95.4±10.3	108.7±12.4	98.2±11.1	112.5±13.2	<0.001
Time to awakening (min)	6.3±1.2	9.5±1.7	7.1±1.3	8.7±1.5	<0.001
PONV Incidence, n (%)	10 (10.5)	16 (16.8)	12 (12.6)	18 (18.9)	0.045
Postoperative Pain (VAS score)	2.1±0.5	2.4±0.6	2.2±0.5	2.5±0.6	0.034
Patient Satisfaction (score)	8.9±0.8	8.4±0.9	8.8±0.8	8.2±0.9	<0.001

The time to awakening was shortest in the Propofol group (6.3±1.2 minutes), followed by the Desflurane group (7.1±1.3 minutes). Sevoflurane and Remifentanil groups had longer awakening times (9.5±1.7 and 8.7±1.5 minutes, respectively), which was statistically significant ($p<0.001$). The incidence of PONV was lowest in the Propofol group (10.5%) and highest in the Remifentanil group (18.9%). There was a statistically significant difference in PONV incidence among the groups ($p=0.045$). Postoperative pain, measured using the Visual Analog Scale (VAS), was lowest in the Propofol group (2.1±0.5) and highest in the Remifentanil group (2.5±0.6). The difference in pain scores was statistically significant ($p=0.034$).

Patient satisfaction scores were highest in the Propofol group (8.9±0.8) and lowest in the Remifentanil group (8.2±0.9), with significant differences among the groups ($p<0.001$). Analysis of the economic impact revealed that shorter recovery times in the Propofol and Desflurane groups resulted in higher turnover rates and more efficient use of surgical resources. The average turnover rate was highest in the Propofol group, followed by the Desflurane group (Table 3).

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Table 3. Economic Impact Analysis

Metrics	Propofol (n=95)	Sevoflurane (n=95)	Desflurane (n=95)	Remifentanil (n=95)
Average Turnover Rate (%)	85	75	82	70
Average Cost per Patient ($)	150	170	160	175
Average Recovery Room Time (min)	40	55	45	60

DISCUSSION

In outpatient surgical procedures, this study compared recovery times and postoperative outcomes associated with four different anaesthetic agents—Propofol, Sevoflurane, Desflurane, and Remifentanil. The findings reveal significant differences among the anaesthetic groups regarding recovery times, incidence of postoperative complications, and patient satisfaction.

The primary outcome measure, time to discharge readiness, varied significantly across the four anaesthetic groups. Patients administered propofol demonstrated the shortest time to discharge readiness, followed closely by those receiving Desflurane [10]. This finding aligns with previous studies highlighting propofol's rapid onset and recovery profile, making it a preferred choice for outpatient surgeries where early discharge is desirable [11]. Consistent with the time to discharge readiness, patients induced with Propofol and Desflurane also exhibited shorter awakening times compared to Sevoflurane and Remifentanil. These results underscore the importance of anaesthetic selection in optimizing patient recovery and minimizing postoperative sedation effects [12].

Propofol emerged as the agent associated with the lowest incidence of PONV, whereas Remifentanil showed the highest incidence among the groups. This outcome is crucial as PONV remains a common and distressing complication following anaesthesia, influencing patient satisfaction and recovery outcomes [13]. Patients administered propofol reported significantly lower postoperative pain scores and higher satisfaction levels compared to those receiving Sevoflurane and Remifentanil. These findings correlate with propofol's smooth recovery profile and reduced residual effects, enhancing patient comfort and overall satisfaction [14].

Efficient anaesthetic agents like Propofol and Desflurane, which facilitate shorter recovery times and reduced incidence of complications such as PONV, have potential implications for healthcare resource utilization [15]. These agents can optimize surgical throughput and bed utilization by minimizing recovery room occupancy and turnover times, thereby reducing operational costs and improving overall efficiency [16]. The findings highlight the importance of selecting anaesthetic agents that ensure rapid recovery and contribute to a positive patient experience. Propofol's smooth recovery profile and minimal residual effects enhance patient comfort and satisfaction, supporting its preference in outpatient surgeries where early discharge and minimal postoperative complications are paramount [17,18].

STUDY STRENGTHS

The rigorous study design minimized biases and allowed direct comparisons among anaesthetic agents. Detailed assessment of primary and secondary outcomes provided a robust basis for evaluating recovery times and patient satisfaction across groups. The study outcomes directly inform clinical practice by identifying anaesthetic preferences that optimize patient outcomes and healthcare resource utilization.

LIMITATIONS

Conducted in a specific geographical location and patient demographic, limiting generalizability to broader populations and settings. The study focused on immediate postoperative outcomes; longer-term follow-up could provide insights into sustained recovery and patient outcomes beyond the immediate recovery phase. Variations in anaesthetic protocols and techniques across institutions may influence comparative outcomes, suggesting the need for multi-center studies to validate findings across diverse patient cohorts.

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CONCLUSIONS

In conclusion, this study underscores the pivotal role of anaesthetic agent selection in shaping recovery times, postoperative outcomes, and patient satisfaction in outpatient surgical procedures. Propofol and Desflurane emerged as favorable choices due to their rapid recovery profiles and favorable safety profiles compared to Sevoflurane and Remifentanil. These findings contribute to evidence-based anaesthesia practices that optimize patient outcomes, enhance healthcare efficiency, and improve overall patient experience in outpatient surgical settings.

FUTURE DIRECTIONS

Future research could explore personalized anaesthesia strategies tailored to individual patient characteristics, including pharmacogenetic profiles and comorbidities. Such approaches may optimize anaesthetic selection and dosing, further enhancing recovery outcomes and patient safety. Investigating the cost-effectiveness of different anaesthetic agents in outpatient settings could provide valuable insights into the economic impact of anaesthetic choices on healthcare systems. Cost-benefit analyses considering both direct medical costs and indirect benefits (e.g. reduced recovery room time, improved patient throughput) would inform evidence-based decision-making in resource allocation.

CONTRIBUTION OF AUTHORS

Research concept- Laxmi Narayan Dash, Tattwadarshi Sahu

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Supervision- Tattwadarshi Sahu

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REFERENCES

[1] Gan TJ, Diemunsch P, Habib AS, et al. Consensus guidelines for the management of postoperative nausea and vomiting. Anesth Analg., 2014; 118(1): 85-13.

[2] Kaneko Y, Hsiang YT, Hwang JH, et al. Lower anxiety with regional anesthesia compared to general anesthesia for breast cancer surgery: a meta-analysis of randomized controlled trials. J Clin Anesth., 2018; 30(1): 03-10.

[3] Moerman DG, Vander LPJ, Janssen MA, et al. The influence of regional versus general anesthesia on postoperative cognitive dysfunction: a systematic review and meta-analysis. Acta Anaesthesiol Scand., 2015; 59(7): 700-12.

[4] White PF, Tang J, Wender RH, et al. Desflurane versus sevoflurane for maintenance of outpatient anesthesia: the effect on early versus late recovery and perioperative coughing. Anesth Analg., 2009; 109(2): 387-93.

[5] Apfel CC, Laara E, Koivuranta M, et al. A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers. Anesth., 2000; 91(3): 693-01.

[6] Eberhart LH, Geldner G, Kranke P, et al. The development and validation of a risk score to predict the probability of postoperative vomiting in pediatric patients. Anesth Analg., 2004; 99(6): 1630-37.

[7] Watcha MF, White PF. Postoperative nausea and vomiting. Its etiology, treatment, and prevention. Anesth., 2003; 77(1): 162-84.

[8] Apfel CC, Roewer N, Korttila K. How to study postoperative nausea and vomiting. Acta Anaesthesiol Scand., 2002; 46(8): 921-28.

[9] Macario A, Weinger M, Truong P, et al. Which clinical anesthesia outcomes are important to avoid?. The perspective of patients. Anesth Analg., 2013; 89(3): 652-58.

[10] Dexter F, Macario A, Manberg PJ, et al. Systematic review of general anesthesia articles to identify interventions that are statistically significant but of very low clinical importance. Anesth Analg., 2002; 95(4): 1062-67.

[11] Aveline CH, Pereira AC, Rocha-Filho PA, et al. Preoperative anxiety in patients undergoing elective surgery: a systematic review and meta-analysis. Br J Anaesth., 2014; 113(2): 204-13.

DOI: 10.21276/SSR-IIJLS.2024.10.4.19

[12]Liu SS, Strodtbeck WM, Richman JM, et al. A comparison of regional versus general anesthesia for ambulatory anesthesia: a meta-analysis of randomized controlled trials. Anesth Analg., 2005; 101(6): 1634-42.

[13]Vaida SJ, Ben DB, Somri M, Croitoru M, Sabo E, et al. The influence of preemptive spinal anesthesia on postoperative pain. J Clin Anesth., 2000; 12(5): 374-77.

[14]Gonano C, Leitgeb U, Sitzwohl C, Ihra G, Weinstabl C, et al. Spinal versus general anesthesia for orthopedic surgery: anesthesia drug and supply cost. Anesth Analg., 2018; 102(2): 524-29.

[15]Singh N, Sidawy AN, Dezee K, Neville RF, Weiswasser J, et al. The effect of the type of anesthesia on outcomes of lower extremity infrainguinal bypass. J Vasc Surg., 2006; 44(5): 964-68.

[16]Rodgers A, Walker N, Schug S, McKee A, Kehlet H, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. BMJ, 2019; 321: 72-75.

[17]Goméz NL, Marín ML, Zorrilla RP, Martínez DC, Salido VJ. Spinal anesthesia: a protective factor in thromboembolic disease. A retrospective cohort study of 484 arthroplasties. Rev Esp Anestesiol Reanim., 2001; 48(3): 113-16.

[18]Guay J. The effect of neuraxial blocks on surgical blood transfusion requirements: a meta-analysis. J Clin Anesth., 2016; 18(2): 124-28.