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TO STUDY THE RECOVERY CHARACTERISTIC OF INTRAVENOUS LIGNOCAINE VERSUS INTRAVENOUS REMIFENTANIL IN ANAESTHESIA FOR DAY CARESURGERY- A COMPARATIVE STUDY

Anaesthesiology

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ABSTRACT

Background: Day-care surgery requires anaesthetic techniques that provide rapid emergence, stable haemodynamics, effective postoperative analgesia and early discharge readiness. Intravenous lignocaine and remifentanil are commonly used perioperative adjuncts, but their effects on recovery characteristics differ. **Objectives:** To compare the recovery characteristics of intravenous lignocaine versus intravenous remifentanil in patients undergoing day-care surgery under general anaesthesia, with respect to emergence profile, postoperative pain, rescue analgesia requirement, haemodynamic stability, adverse effects and patient satisfaction. **Materials and Methods:** This prospective randomized controlled study included 80 ASA I–II patients aged 18–60 years undergoing elective day-care surgery under general anaesthesia. Patients were equally allocated to receive either intravenous lignocaine or remifentanil. Haemodynamic parameters, emergence profile, VAS score, recovery scores, rescue analgesia, adverse events and patient satisfaction were assessed. Data were analysed using SPSS version 24. **Results:** Baseline haemodynamics and anaesthesia duration were comparable. Remifentanil produced significantly faster emergence, whereas lignocaine resulted in lower postoperative VAS scores, reduced rescue analgesia, shorter total recovery and PACU stay, higher PADS score and better patient satisfaction. **Conclusion:** Intravenous remifentanil provided faster immediate emergence, whereas intravenous lignocaine offered superior postoperative analgesia, reduced rescue analgesic requirement and better discharge-oriented recovery. Lignocaine may be a favourable adjunct for day-care surgery when overall recovery quality and patient comfort are prioritized.

KEYWORDS

Day-Care Surgery, Intravenous Lignocaine, Remifentanil, Recovery Characteristics, Postoperative Analgesia, PACU Stay, Patient Satisfaction.

INTRODUCTION

Day-care surgery has become an important model of perioperative care because selected patients can undergo elective procedures with planned same-day discharge when anaesthesia provides rapid recovery, stable physiology and adequate postoperative comfort. Intravenous lignocaine has increasingly been discussed as an overlooked perioperative analgesic with potential value beyond local anaesthesia, particularly because of its systemic analgesic and opioid-sparing properties.[1] Recent educational reviews also describe perioperative lignocaine as a useful adjunct when administered with appropriate dosing, monitoring and awareness of toxicity.[2]

In India, day-care surgical pathways are gaining practical relevance in tertiary hospitals because they may improve patient turnover, reduce inpatient burden and support cost-effective surgical care.[3] Within such pathways, intravenous lignocaine has been described in Indian anaesthesia literature as a drug that extends from regional use to systemic perioperative application, with possible benefits in analgesia and recovery.[4] Its anaesthetic, analgesic and immune-modulatory actions further support its role in multimodal perioperative practice, especially where residual sedation and respiratory depression are undesirable.[5]

Enhanced recovery in ambulatory surgery depends on multimodal analgesia, as balanced non-opioid strategies can reduce excessive opioid exposure and facilitate earlier functional recovery.[6] Standardised discharge assessment is equally important, and postoperative scoring systems help determine readiness for transfer and safe discharge after outpatient anaesthesia.[7] Population pharmacokinetic evidence for intravenous lidocaine highlights interpatient variability, reinforcing the need for protocol-based administration in clinical studies.[8]

Remifentanil remains a valuable intraoperative opioid because of its rapid titratability; however, evidence suggests that higher intraoperative doses may be associated with increased postoperative pain and hyperalgesia.[9] Recent evidence also indicates that intravenous lidocaine can reduce the effective concentration of remifentanil required to prevent cough during emergence, suggesting a remifentanil-sparing effect during recovery from general anaesthesia.[10] In female patients undergoing thyroidectomy, lidocaine administered through the perforated outer cuff of a dual-cuff endotracheal tube was compared with remifentanil during recovery, with assessment of cough response, haemodynamic changes and early recovery parameters.[11] In ambulatory gynaecological laparoscopy, intraoperative lidocaine infusion has also been associated with improved postoperative pain and quality of recovery.[12] Therefore, this study was undertaken in an Indian tier II government teaching hospital setting to compare intravenous lignocaine and remifentanil for emergence, pain, recovery scores, haemodynamic stability, adverse effects and patient satisfaction.

MATERIAL AND METHODS

Study Design: Prospective, randomized controlled comparative study.

Study Setting: Baba Raghav Das Medical College, Gorakhpur, Uttar Pradesh.

Study Population: Adults undergoing elective day-care surgery under general anaesthesia.

Sample Size: 80 patients were enrolled and randomized equally into Group L, receiving intravenous lignocaine, and Group R, receiving intravenous remifentanil, with 40 patients in each group.

Inclusion Criteria: Patients aged 18–60 years, belonging to ASA physical status I or II, willing to participate in the study, and scheduled for elective day-care surgery requiring general anaesthesia were included.

Exclusion Criteria: Patients who refused participation, had known allergy to lignocaine or remifentanil, significant cardiovascular, hepatic or renal disease, pregnancy or lactation, chronic opioid use, or neurological disorders likely to affect recovery were excluded.

Randomization and Group Allocation: Patients were randomized into two equal groups using a computer-generated table. Group L received lignocaine 1.5 mg/kg IV followed by 2 mg/kg/hour infusion, while Group R received remifentanil 1 µg/kg IV followed by 3

µg/kg/hour infusion until before emergence.

Anaesthetic Technique: Standard monitoring was applied. Patients received midazolam, glycopyrrolate, propofol and vecuronium, followed by endotracheal intubation. Anaesthesia was maintained with oxygen, nitrous oxide, isoflurane and intermittent vecuronium. Paracetamol and ondansetron were given to all patients.

Data Collection and Outcome Assessment: Haemodynamic parameters, emergence times, Modified Aldrete Score, PADS, VAS pain score, rescue analgesia, patient satisfaction and adverse events were recorded.

Postoperative Care: Infusions were stopped two minutes before extubation. Neuromuscular blockade was reversed, and patients were observed in PACU. Diclofenac 75 mg IV was used as rescue analgesia.

Ethical Consideration: Institutional approval and written informed consent were obtained. Confidentiality and voluntary participation were maintained.

Statistical Analysis: Data were analysed using SPSS version 24. Continuous variables were compared using independent t-test or Mann–Whitney U test, and categorical variables using Chi-square test. A p-value <0.05 was considered significant.

RESULTS

Table 1. Comparison of Baseline Hemodynamic Parameters

Variable	Group L (n=40)	Group R (n=40)	t value	df	P Value
HR (bpm)	77.9 ± 6.67	79.3 ± 6.83	−0.894	78	0.374
SBP (mmHg)	123.67 ± 5.06	124.1± 5.56	- 0.361	39	0.720
DBP (mmHg)	77.95 ± 4.21	79.05± 5.01	- 1.068	39	0.292
MAP (mmHg)	93.2 ± 4.36	94.2 ± 5.11	− 0.895	78	0.374

Independent t test.

As shown in Table 1, baseline haemodynamic parameters were comparable between Group L and Group R. Heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure showed no statistically significant intergroup differences (p>0.05). This indicates that both groups had similar preoperative haemodynamic status before administration of the study drugs.

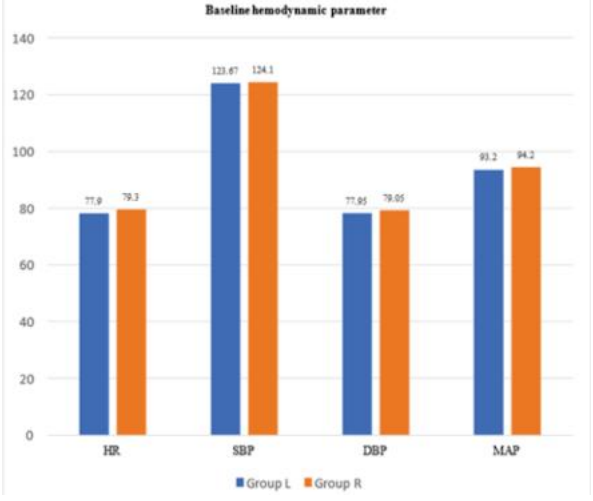

Figure 1: Baseline Hemodynamic Parameter

Table 2. Comparison of Duration of Anaesthesia

Variable	Group L (n = 40)	Group R (n = 40)	t value	df	P Value
Duration of Anaesthesia (min)	66.0±12.0	67.1±11.9	−0.422	78	0.675

Independent t test.

As shown in Table 2, the duration of anaesthesia was comparable between Group L and Group R. The mean duration was 66.0 ± 12.0 minutes in Group L and 67.1 ± 11.9 minutes in Group R, with no statistically significant difference (p=0.675), indicating similar anaesthetic exposure in both groups.

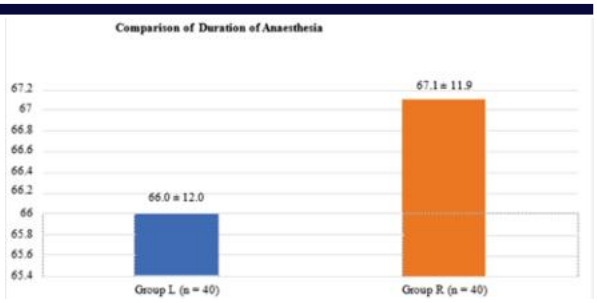

Figure 2: Comparison of Duration of Anaesthesia

Table 3. Comparison of Emergence Characteristics

Variable	Group L (n = 40)	Group R (n = 40)	t value	df	P Value
Time to Spontaneous Breathing (min)	4.88 ± 0.442	4.51 ± 0.489	3.50	78	<0.001
Time to Eye Opening (min)	6.23 ± 0.485	5.88 ± 0.505	3.21	78	0.002
Time to Verbal Response (min)	7.01 ± 0.517	6.63 ± 0.542	3.25	78	0.002
Time to Extubation (min)	6.57 ± 0.489	6.25 ± 0.477	2.96	78	0.004

Independent t test.

As shown in Table 3, emergence from anaesthesia was significantly faster in Group R than in Group L. Time to spontaneous breathing, eye opening, verbal response, and extubation were all shorter with remifentanil, with statistically significant differences across all parameters (p<0.05). This indicates earlier immediate emergence in the remifentanil group.

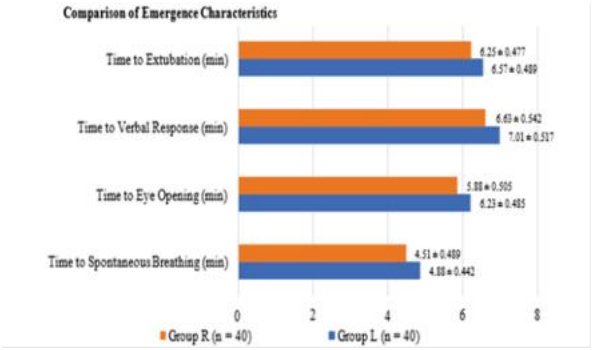

Figure 3: Comparison of Emergence Characteristics

Table 4. Comparison of Visual Analogue Scale (VAS) Scores at Different Time Intervals.

Time	Group L (n = 40)	Group R (n = 40)	P Value
15 min	3.92 ± 0.73	4.50 ± 0.51	<0.001
30 min	2.88 ± 0.72	3.82 ± 0.59	<0.001
60 min	2.08 ± 0.62	3.18 ± 0.45	<0.001

Repeated Measures ANOVA.

As shown in Table 4, postoperative VAS scores were significantly lower in Group L compared with Group R at 15, 30, and 60 minutes. Pain scores declined progressively in both groups, but lignocaine provided consistently better analgesia throughout the observation period, with statistically significant differences at all time points (p<0.001).

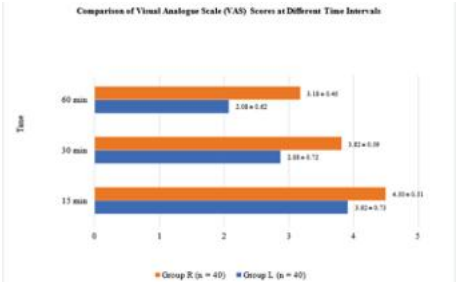

Figure 4: Comparison of VAS Score at Different Time Interval

Table 5. Comparison of Requirement of Rescue Analgesia

Rescue Analgesia Required	Group L (n = 40) n (%)	Group R (n = 40) n (%)	P Value
No	28 (70.0)	13 (32.5)	<0.001
Yes	12 (30.0)	27 (67.5)	

χ^2 test applied

As shown in Table 5, the requirement for rescue analgesia was significantly lower in Group L than in Group R. Only 30.0% of patients in the lignocaine group required rescue analgesia compared with 67.5% in the remifentanil group (p<0.001), indicating superior postoperative analgesic efficacy with intravenous lignocaine.

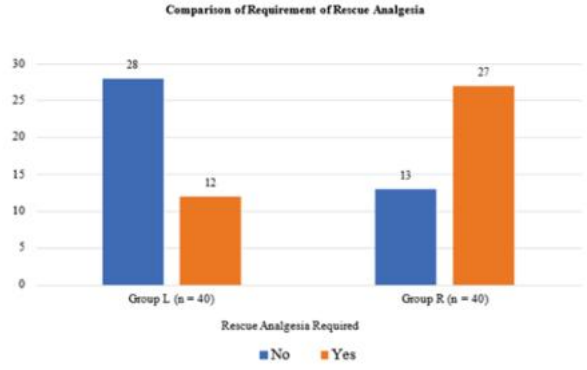

Figure 5: Comparison of Requirement of Rescue Analgesia

Table 6. Comparison of Recovery Profile and Patient Satisfaction

Variable	Group L (n=40)	Group R (n=40)	t value	df	P Value
Total Recovery Time (min)	49.75 ± 5.499	55.00 ± 6.884	−3.77	78	<0.001
Duration of PACU Stay (min)	44.30 ± 5.105	50.33 ± 6.904	−4.44	78	<0.001
PADS Score	9.50 ± 0.506	9.15 ± 0.662	2.66	78	0.010
Patient Satisfaction Score (1–5)	4.53 ± 0.506	4.17 ± 0.675	2.62	78	0.010

Independent t test.

As shown in Table 6, Group L demonstrated a significantly better recovery profile than Group R. Total recovery time and PACU stay were shorter with lignocaine, while PADS and patient satisfaction scores were significantly higher (p<0.05). These findings indicate faster overall recovery, earlier discharge readiness, and better patient experience in the lignocaine group.

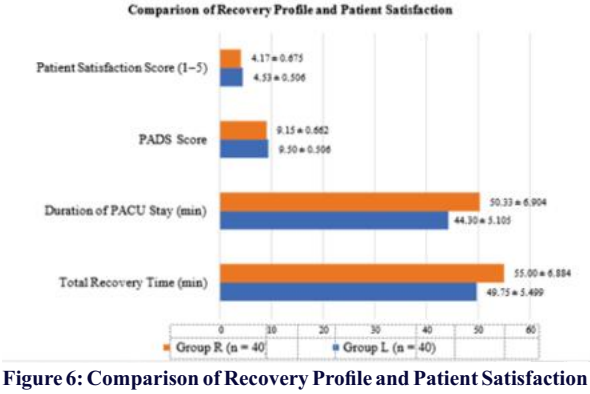

Figure 6: Comparison of Recovery Profile and Patient Satisfaction

DISCUSSION

Baseline haemodynamic parameters were comparable between the two groups, indicating appropriate baseline matching before drug administration. Heart rate was 77.9 ± 6.67 bpm in Group L and 79.3 ± 6.83 bpm in Group R (p=0.374), while SBP, DBP and MAP were also statistically similar. This aligns with Lin et al. (2024)[10] and Awal et al. (2022)[12], where standardized randomization and perioperative monitoring supported valid group comparison. Li et al. (2022)[11] also assessed haemodynamic changes during recovery, while Kundra and Vinayagam (2020)[4] emphasized careful cardiovascular monitoring during intravenous lignocaine use. Huang et al. (2024)[9] differed by focusing mainly on remifentanil dose-related postoperative pain rather than baseline haemodynamic comparability.

Duration of anaesthesia was similar in both groups, with Group L recording 66.0 ± 12.0 minutes and Group R recording 67.1 ± 11.9 minutes (p=0.675). This comparable exposure reduces the possibility that recovery differences were influenced by unequal anaesthetic duration. Similar methodological standardization was seen in Awal et al. (2022)[12], where lignocaine was administered as 1.5 mg/kg followed by 2 mg/kg/hour until surgery completion. Lin et al. (2024)[10] also used the same intravenous lidocaine regimen during thyroid surgery. Li et al. (2022)[11] compared recovery after thyroidectomy under controlled randomized conditions. In contrast, Bhole et al. (2025)[3] evaluated day-care feasibility and reported mean hospital stay of 20.5 hours, rather than anaesthesia duration.

Emergence was significantly faster in Group R than Group L. Time to spontaneous breathing was 4.88 ± 0.442 versus 4.51 ± 0.489 minutes (p<0.001), eye opening was 6.23 ± 0.485 versus 5.88 ± 0.505 minutes (p=0.002), verbal response was 7.01 ± 0.517 versus 6.63 ± 0.542 minutes (p=0.002), and extubation was 6.57 ± 0.489 versus 6.25 ± 0.477 minutes (p=0.004). This is consistent with remifentanil's rapid offset. Lin et al. (2024)[10] showed intravenous lidocaine reduced remifentanil EC50 from 1.40 ng/mL to 0.83 ng/mL during emergence. Li et al. (2022)[11] reported better recovery parameters with lidocaine, contrasting with the faster immediate emergence observed in Group R.

Postoperative pain scores were consistently lower in Group L than Group R at 15 minutes, 30 minutes and 60 minutes, with VAS scores of 3.92 ± 0.73 versus 4.50 ± 0.51, 2.88 ± 0.72 versus 3.82 ± 0.59, and 2.08 ± 0.62 versus 3.18 ± 0.45, respectively, all showing statistical significance (p<0.001). Similar analgesic benefit of lignocaine was reported by Awal et al. (2022)[12], where intraoperative lidocaine reduced PACU and 24-hour pain scores in 50 ambulatory gynaecological laparoscopic patients. Khan et al. (2022)[1] and Kundra and Vinayagam (2020)[4] also described reduced early postoperative pain with intravenous lidocaine. Huang et al. (2024)[9] contrasted this by focusing on remifentanil dose-related hyperalgesia in 2,019 patients, supporting the higher pain trend seen in Group R.

Rescue analgesia requirement was significantly lower in Group L, where 12 patients (30.0%) required additional analgesia compared with 27 patients (67.5%) in Group R (p<0.001), while 28 patients (70.0%) in Group L and 13 patients (32.5%) in Group R did not require rescue analgesia. This agrees with Awal et al. (2022)[12], who reported reduced 24-hour analgesic use with intraoperative lidocaine in 50 patients. Khan et al. (2022)[1] and Lee and Schraag (2022)[5] also described opioid-sparing effects of intravenous lidocaine, while Kaye et al. (2019)[6] emphasized multimodal analgesia to reduce opioid reliance in ambulatory care. In contrast, Huang et al. (2024)[9] found that higher remifentanil doses were associated with greater postoperative pain, which clinically explains the higher rescue analgesia requirement observed in Group R.

Recovery profile was more favorable in Group L, with shorter total recovery time (49.75 ± 5.499 versus 55.00 ± 6.884 minutes, p<0.001), shorter PACU stay (44.30 ± 5.105 versus 50.33 ± 6.904 minutes, p<0.001), higher PADS score (9.50 ± 0.506 versus 9.15 ± 0.662, p=0.010), and higher patient satisfaction score (4.53 ± 0.506 versus 4.17 ± 0.675, p=0.010). Similar recovery-oriented benefits were reported by Awal et al. (2022)[12], where lidocaine improved QoR-40 scores and reduced time to PADSS ≥9. Li et al. (2022)[11] also reported shortened recovery and PACU stay with lidocaine-based airway management in 98 thyroidectomy patients. Bhole et al. (2025)[3] documented 94.12% satisfactory or very satisfactory experience in Indian day-care surgery. The distinct finding here is that lignocaine improved overall discharge-oriented recovery despite remifentanil showing faster immediate emergence.

CONCLUSION

Overall, the findings support the research hypothesis that both intravenous lignocaine and remifentanil provide acceptable recovery profiles in day-care anaesthesia, with lignocaine showing a clinical advantage in overall postoperative recovery. Remifentanil produced significantly earlier immediate emergence, as reflected by shorter time to spontaneous breathing, eye opening, verbal response and extubation; however, this benefit did not translate into superior later recovery. Intravenous lignocaine was associated with significantly

lower VAS scores at all postoperative intervals, reduced rescue analgesia requirement, shorter total recovery time and PACU stay, higher PADS score and better patient satisfaction. Baseline haemodynamics and anaesthesia duration were comparable, indicating that the observed differences were more likely related to the study drugs rather than patient or procedural variability. In line with the available literature, lignocaine appeared to provide sustained analgesic and discharge-oriented benefits without compromising haemodynamic stability. Thus, for elective day-care surgery under general anaesthesia in this Indian hospital setting, intravenous lignocaine may be considered a more favourable adjunct when the priority is smoother postoperative recovery, analgesic adequacy, early discharge readiness and patient comfort.

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