RESEARCH PAPER

Perceive Pain Management Efficacy And Satisfaction In General And Regional Anaesthesia Among Patients During Their Post-Operative Phase – An Observational Study

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ABSTRACT

Background: Postoperative pain affects recovery and patient experience. Regional anaesthesia may provide prolonged analgesia, although outcomes vary with clinical characteristics.

Aim/Objectives: To compare postoperative pain and patient satisfaction at 1 and 24 hours after surgery in adults receiving general anaesthesia (GA) or regional anaesthesia (RA), and their association.

Materials and Methods: This hospital-based observational comparative study was conducted from August 2024 to August 2025. The dataset included 100 adults, 50 in each group. Pain was measured using a 0–10 Visual Analogue Scale and satisfaction using a 10-point numerical rating scale at 1 and 24 hours. Groups were compared using Welch's t-test and pain–satisfaction associations using Spearman's correlation.

Results: Mean age was 38.12 ± 5.40 years with GA and 55.80 ± 5.17 years with RA ($p < 0.001$). VAS pain was lower with RA at 1 hour (3.52 vs 6.44; mean difference, −2.92; 95% CI, −3.35 to −2.49; $p < 0.001$) and 24 hours (2.88 vs 4.96; mean difference, −2.08; 95% CI, −2.38 to −1.78; $p < 0.001$). Satisfaction was higher with RA at both time points (8.48 vs 6.16 and 8.56 vs 5.16; both $p < 0.001$). Pain and satisfaction were inversely correlated at 1 hour ($\rho = -0.728$) and 24 hours ($\rho = -0.761$), both $p < 0.001$.

Conclusion: Regional anaesthesia was associated with less pain and greater satisfaction during the first 24 hours. Age and sex imbalance limits causal interpretation.

Keywords: Anaesthesia, general; Anaesthesia, regional; Postoperative pain; Patient satisfaction; Pain measurement; Visual analogue scale.

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INTRODUCTION

Postoperative pain remains one of the most common and clinically important consequences of surgery. Although modern perioperative practice increasingly emphasises multimodal analgesia, a substantial proportion of patients continue to experience clinically relevant pain after surgery. Inadequately controlled pain can interfere with mobilisation, sleep and participation in rehabilitation and may adversely affect the overall recovery experience.[1]

The anaesthetic technique is one component of perioperative pain management. General anaesthesia provides unconsciousness and amnesia but is commonly followed by the need for systemic postoperative analgesia. Regional anaesthesia, including neuraxial and peripheral nerve techniques, interrupts nociceptive transmission and may provide analgesia that extends into the early postoperative period. Comparative studies and meta-analyses have reported reductions in early postoperative pain and analgesic requirements with selected regional techniques, although the magnitude of benefit depends on the type of surgery, regional technique and accompanying analgesic regimen.[2-4]

Patient satisfaction is a broader outcome than pain intensity alone. Large observational studies have shown that postoperative pain is associated with dissatisfaction, while communication, expectations, perioperative experience and other anaesthesia-related events also contribute to how patients evaluate their care.[5,6] Importantly, regional anaesthesia does not invariably result in greater satisfaction; discomfort during block placement, inadequate block effect and prolonged numbness can adversely affect patient experience.[7]

The present study was undertaken to compare postoperative pain intensity and patient satisfaction at 1 and 24 hours in patients receiving general or regional anaesthesia in routine clinical practice. A secondary objective was to assess the association between postoperative pain and satisfaction. The study was designed to describe patient-reported outcomes rather than to establish a causal effect of one anaesthetic technique over another.

MATERIALS AND METHODS

Study design and setting

This hospital-based observational comparative study was conducted at a tertiary care teaching hospital from August 2024 to August 2025. The study protocol received approval from the Institutional Ethics Committee of Vinayaka Missions Medical College and Hospitals, Salem (Approval No. VMKVMC&H/IEC/24/243). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrolment.

Participants

Adults undergoing elective surgery under either general or regional anaesthesia were eligible for inclusion. The source protocol included patients undergoing orthopaedic, abdominal and lower-limb procedures, with an anticipated operative duration of approximately 1–3 hours. Patients with American Society of Anesthesiologists physical status I or II who were able to complete the pain and satisfaction assessments were eligible. Patients with psychiatric illness, cognitive impairment, chronic opioid use, emergency surgery, postoperative ventilatory support, combined anaesthetic techniques, or inability to understand the assessment scales were excluded. Regional anaesthesia comprised spinal anaesthesia and peripheral nerve blocks; epidural anaesthesia and combined general–epidural techniques were excluded.

Perioperative management and outcomes

The postoperative analgesic protocol for patients receiving general anaesthesia consisted of intravenous paracetamol with rescue tramadol when required. Patients receiving regional anaesthesia did not receive additional epidural analgesia. Postoperative pain was assessed at 1 and 24 hours using a 0–10 Visual Analogue Scale, with higher scores indicating greater pain. Patient satisfaction was assessed at the same time points using a 10-point numerical rating scale, with higher scores indicating greater satisfaction.

Statistical analysis

The final analysis was based on 100 participants, comprising 50 patients in each anaesthesia group. Continuous variables are presented as mean ± standard deviation. Between-group comparisons were performed using Welch's independent-samples t-test because it does not require equal variances between groups. Categorical variables were summarised as frequencies and percentages. Spearman's rank correlation coefficient was used to assess the association between postoperative pain and satisfaction. Mean differences are reported with 95% confidence intervals where available, and Cohen's d was used to describe standardized between-group effects. All tests were two-sided, and $p < 0.05$ was considered statistically significant. Analyses were performed using R

statistical software; the exact version should be entered from the analysis environment before submission..

Because pain and satisfaction were measured repeatedly within the same participants, a longitudinal mixed-effects analysis would be the preferred approach for a definitive repeated-measures inference. The present manuscript therefore emphasises the time-specific group comparisons and correlation analyses and does not interpret the unadjusted results as causal. Sex was completely separated by anaesthesia group in the final dataset and therefore could not be included as an independent adjustment covariate.

RESULTS

Participant characteristics

The final verified dataset contained 100 participants, with 50 patients receiving general anaesthesia and 50 receiving regional anaesthesia. The mean age was 38.12 ± 5.40 years in the GA group and 55.80 ± 5.17 years in the RA group, a mean difference of −17.68 years (95% CI, −19.78 to −15.58; $p < 0.001$). Sex distribution was completely separated between groups: all 50 patients in the GA group were female and all 50 patients in the RA group were male. This imbalance is important when interpreting the study because sex is completely confounded with anaesthesia group and cannot be disentangled statistically within this dataset (Table 1).

Postoperative pain

Patients receiving regional anaesthesia reported substantially lower pain at both postoperative assessments (Table 2). At 1 hour, mean VAS was 3.52 ± 1.11 in the RA group compared with 6.44 ± 1.07 in the GA group. The mean difference was −2.92 points (95% CI, −3.35 to −2.49; $p < 0.001$), corresponding to a very large standardized effect (Cohen's d = 2.67 in absolute magnitude). At 24 hours, mean VAS was 2.88 ± 0.77 with RA and 4.96 ± 0.73 with GA, giving a mean difference of −2.08 points (95% CI, −2.38 to −1.78; $p < 0.001$; Cohen's d = 2.77 in absolute magnitude). The trajectory plot (Figure 1) shows that the regional group remained consistently below the general anaesthesia group at both time points. The distribution of 1-hour VAS scores is shown in Figure 3.

Patient satisfaction

Patient satisfaction was also substantially higher in the regional anaesthesia group (Table 3; Figure 2). At 1 hour, satisfaction was 8.48 ± 0.50 with RA compared with 6.16 ± 0.79 with GA (mean difference, 2.32 points; $p < 0.001$; Cohen's d = 3.49 in absolute magnitude). At 24 hours, the corresponding values were 8.56 ± 0.50 and 5.16 ± 0.79, respectively (mean difference, 3.40 points; $p < 0.001$; Cohen's d = 5.13 in absolute magnitude).

Association between pain and satisfaction

There was a strong inverse relationship between postoperative pain and satisfaction (Table 4; Figure 4). At 1 hour, Spearman's ρ was −0.728 ($p < 0.001$), while at 24 hours it was −0.761 ($p < 0.001$). Thus, patients reporting greater postoperative pain generally reported lower satisfaction. This relationship supports the clinical relevance of effective pain control but does not establish that pain alone determines satisfaction.

Baseline age distribution

The age distribution differed clearly between groups (Supplementary Figure S1). This baseline imbalance is relevant because age may influence pain reporting, recovery and satisfaction. The age difference therefore represents a potential source of confounding in the observed association between anaesthesia group and postoperative outcomes.

Table 1. Baseline demographic characteristics according to anaesthesia group

Characteristic	General anaesthesia (n=50)	Regional anaesthesia (n=50)	P value
Age, years, mean ± SD	38.12 ± 5.40	55.80 ± 5.17	<0.001
Female, n (%)	50 (100.0)	0 (0.0)	<0.001*
Male, n (%)	0 (0.0)	50 (100.0)	

Note. Values are mean ± standard deviation or number (percentage). Age was compared using Welch's independent-samples t-test. *Fisher's exact test. Sex was completely confounded with anaesthesia group and therefore was not suitable for independent adjustment.

Table 2. Postoperative pain scores according to anaesthesia group

Assessment	General anaesthesia	Mean difference (RA−GA)	Mean difference (GA−RA)	95% CI	P value	Cohen's d
VAS at 1 hour	6.44 ± 1.07	−2.92	2.92	2.49 to 3.35	<0.001	2.67
VAS at 24 hours	4.96 ± 0.73	−2.08	2.08	1.78 to 2.38	<0.001	2.77

Note. Values are mean ± standard deviation. P values are from Welch's independent-samples t-tests. Cohen's d is reported as the absolute standardized between-group effect size.

Table 3. Patient satisfaction according to anaesthesia group

Assessment	General anaesthesia	Regional anaesthesia	Mean difference (RA−GA)	95% CI	P value	Cohen's d
Satisfaction at 1 hour	6.16 ± 0.79	8.48 ± 0.50	2.32	2.06 to 2.58	<0.001	3.49
Satisfaction at 24 hours	5.16 ± 0.79	8.56 ± 0.50	3.40	3.14 to 3.66	<0.001	5.13

Note. Values are mean ± standard deviation. P values are from Welch's independent-samples t-tests. Mean differences are calculated as RA−GA; positive values indicate higher satisfaction in the regional anaesthesia group. Cohen's d is reported as absolute magnitude.

Table 4. Association between postoperative pain and patient satisfaction

Assessment time	Spearman's ρ	P value	Interpretation
1 hour	−0.728	<0.001	Strong inverse correlation
24 hours	−0.761	<0.001	Strong inverse correlation

Note. Spearman's rank correlation was used. Higher pain scores were associated with lower satisfaction scores.

Figure 4. Association between postoperative VAS pain and patient satisfaction at 1 hour. The fitted line is shown for visualisation; the reported association was assessed using Spearman's rank correlation ($\rho = -0.728$, $p < 0.001$).

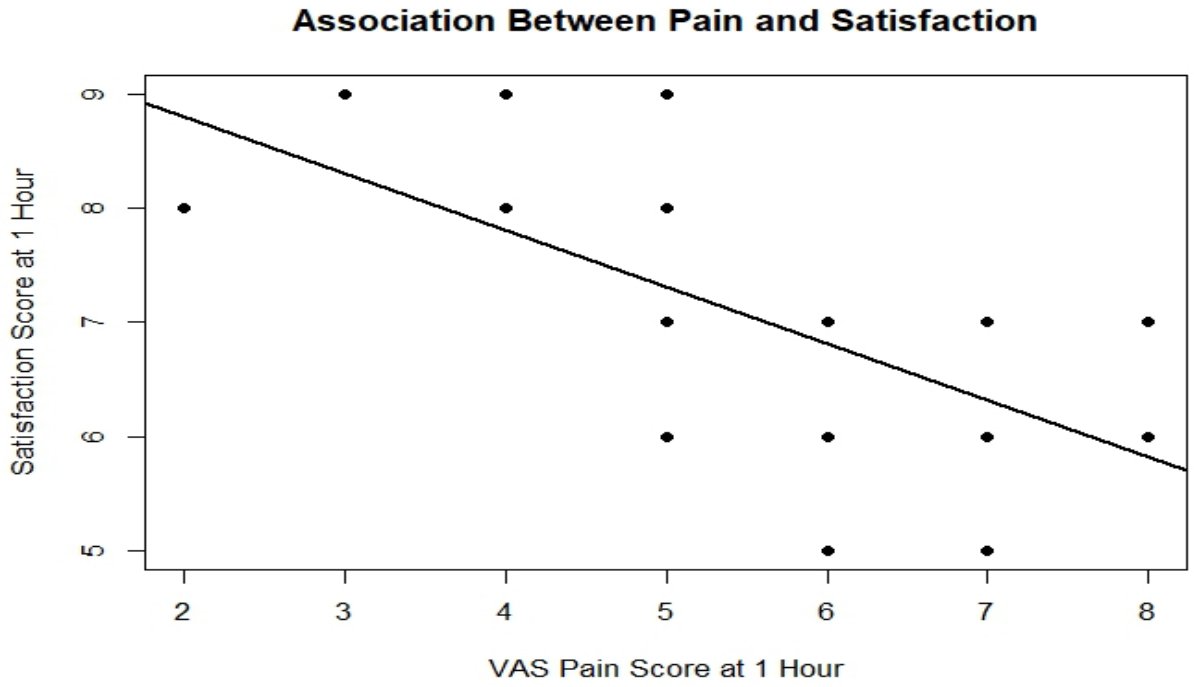


Figure 3. Distribution of postoperative VAS pain scores at 1 hour according to anaesthesia group. Boxplots show the median, interquartile range and overall distribution of observed scores.

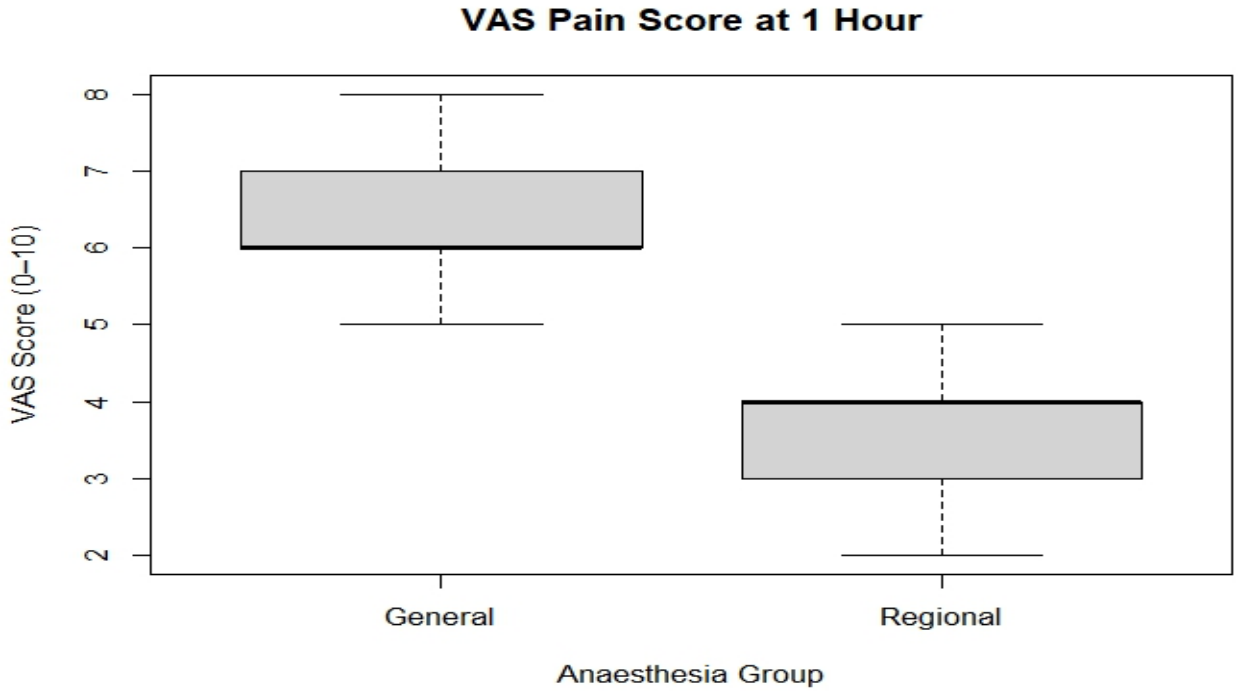


Figure 2. Patient satisfaction scores according to anaesthesia group. Points show group means and error bars show 95% confidence intervals at 1 and 24 hours after surgery. Higher scores indicate greater satisfaction.

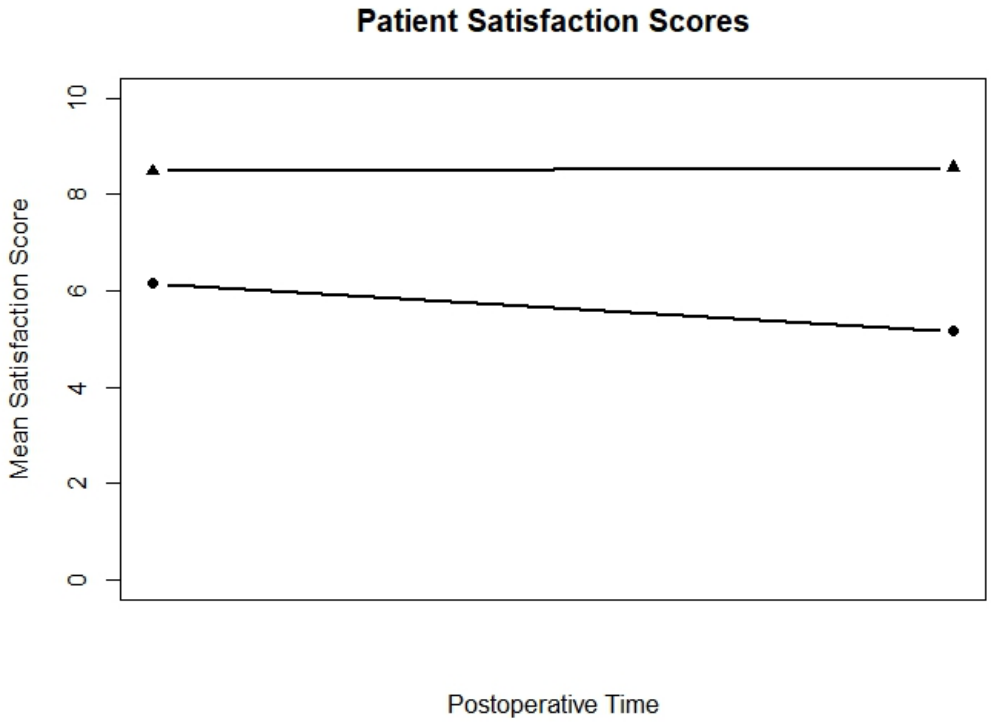
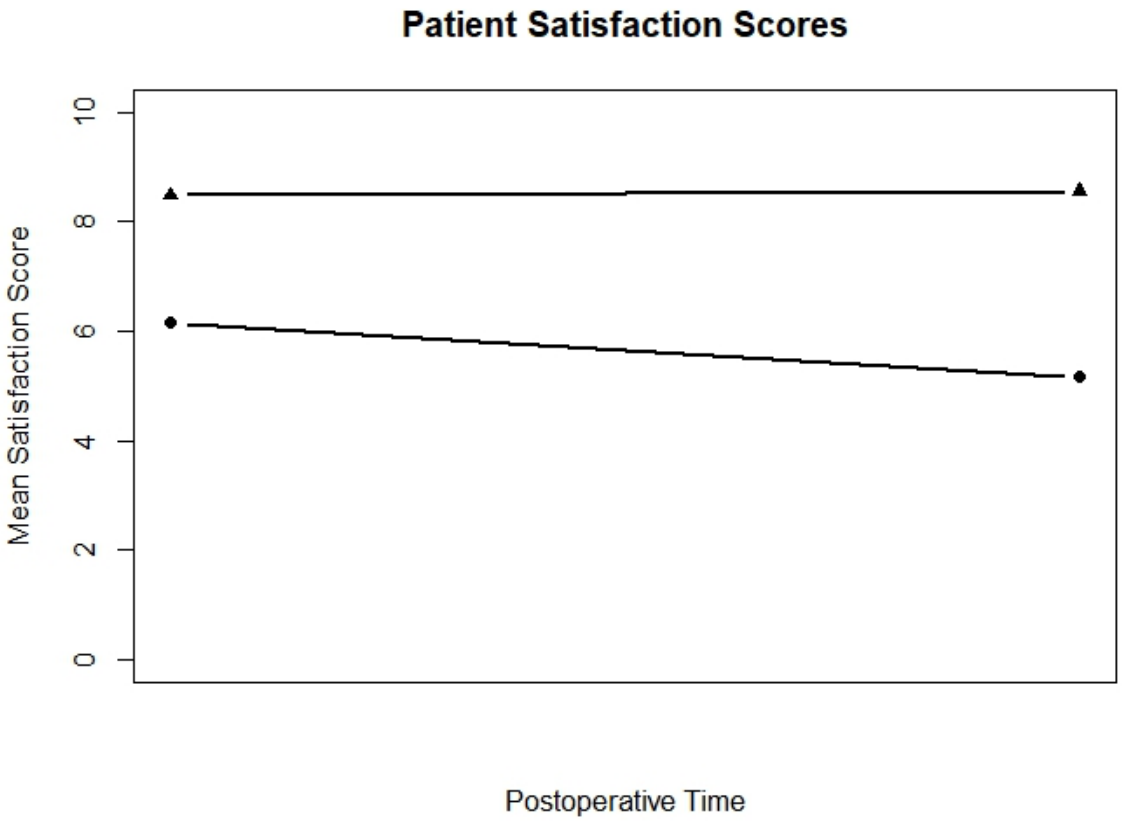


Figure 1. Postoperative VAS pain scores according to anaesthesia group. Points show group means and error bars show 95% confidence intervals at 1 and 24 hours after surgery. Lower scores indicate less pain.



DISCUSSION

In this hospital-based observational study, patients receiving regional anaesthesia reported substantially less postoperative pain and greater satisfaction than those receiving general anaesthesia at both 1 and 24 hours. The magnitude of the observed differences was large: the between-group difference in VAS was 2.92 points at 1 hour and 2.08 points at 24 hours, while satisfaction differed by 2.32 and 3.40 points at the corresponding time points. In addition, pain and satisfaction were strongly and inversely correlated at both assessments.

The lower pain scores observed after regional anaesthesia are biologically plausible. Neuraxial and peripheral regional techniques can interrupt nociceptive transmission and provide site-specific analgesia that persists into the early postoperative period. Previous comparative studies have reported reductions in early postoperative pain and analgesic requirements with regional techniques, although the benefit is not uniform across procedures and depends on the specific block and multimodal analgesic strategy.[2-4] Recent evidence also emphasises that the effect of regional anaesthesia is procedure-specific and should not be generalized across all surgical populations.[3,4]

Our findings regarding patient satisfaction are broadly consistent with observational studies in which regional anaesthesia was associated with higher satisfaction than general anaesthesia.[8] However, satisfaction is a multidimensional outcome and should not be reduced to pain intensity alone. A large prospective survey demonstrated associations between dissatisfaction and postoperative pain, nausea and vomiting, and other perioperative factors.[5] Other studies have shown that communication, expectations, anxiety and the patient's experience of the anaesthetic procedure can meaningfully influence satisfaction.[6,7] Therefore, the strong inverse correlation observed in the present study should be interpreted as one component of a broader patient experience.

The present study also highlights an important methodological issue. The two anaesthesia groups were not comparable at baseline: the regional anaesthesia group was considerably older, and sex was completely separated by group. Because all participants receiving general anaesthesia were female and all participants receiving regional anaesthesia were male, the effect of sex cannot be estimated independently of anaesthesia technique in this dataset. Age also differed substantially between groups. Consequently, the large unadjusted differences in pain and satisfaction cannot

be interpreted as demonstrating that anaesthesia technique alone caused the observed outcomes. This is particularly important because age, sex, surgical procedure, expectations and perioperative communication may all influence patient-reported outcomes.

For the same reason, predictive modelling of anaesthesia type using postoperative pain and satisfaction would not be clinically informative and could be misleading. Pain and satisfaction are outcomes occurring after the anaesthetic exposure, rather than baseline predictors of which anaesthesia technique should be selected. The present analysis therefore focuses on clinically interpretable between-group comparisons and the association between the two patient-reported outcomes.

The study has several strengths. Pain and satisfaction were assessed at two clinically relevant postoperative time points, both outcomes were measured using simple patient-reported scales, and the analysis reports effect sizes in addition to p values. The consistent direction of the findings across both outcomes and time points also strengthens the internal coherence of the observed results.

Several limitations should be considered. First, the observational design permits confounding and does not establish causality. Second, the study population was relatively small and was drawn from a single tertiary centre. Third, the surgical procedures were heterogeneous, and the dataset does not permit a sufficiently powered procedure-specific analysis. Fourth, the two groups were markedly imbalanced with respect to age and completely separated by sex, limiting the ability to estimate an independent anaesthesia effect. Fifth, postoperative analgesic requirements beyond the recorded protocol were not comprehensively quantified as morphine-equivalent consumption. Finally, the study assessed outcomes only through 24 hours and therefore cannot address longer-term recovery or persistent postoperative pain.

Future studies should use a larger, prospectively defined cohort or randomized design, ensure better balance of important baseline characteristics, and incorporate procedure-specific stratification. A longitudinal mixed-effects model should be prespecified for repeated pain and satisfaction measurements, with clinically relevant covariates such as age, sex, type of surgery and analgesic exposure included where appropriate. Additional outcomes such as opioid consumption, postoperative nausea and vomiting, mobilisation, length of stay and longer-term pain would provide a more comprehensive assessment of the comparative value of regional and general anaesthesia.

CONCLUSIONS

Regional anaesthesia was associated with substantially lower postoperative pain and higher patient satisfaction at 1 and 24 hours compared with general anaesthesia in this observational study. The strong inverse relationship between pain and satisfaction supports the importance of effective postoperative analgesia as part of patient-centred perioperative care. However, substantial baseline differences between the anaesthesia groups, particularly age and complete sex separation, limit causal interpretation. Larger studies with better-balanced groups and appropriate longitudinal adjustment are needed before concluding that the observed differences are attributable solely to anaesthesia technique.

FIGURE LEGENDS

Figure 1. Postoperative VAS pain scores according to anaesthesia group. Points show group means and error bars show 95% confidence intervals at 1 and 24 hours after surgery. Lower scores indicate less pain.

Figure 2. Patient satisfaction scores according to anaesthesia group. Points show group means and error bars show 95% confidence intervals at 1 and 24 hours after surgery. Higher scores indicate greater satisfaction.

Figure 3. Distribution of postoperative VAS pain scores at 1 hour according to anaesthesia group. Boxplots show the median, interquartile range and overall distribution of observed scores.

Figure 4. Association between postoperative VAS pain and patient satisfaction at 1 hour. The fitted line is shown for visualisation; the reported association was assessed using Spearman's rank correlation ($\rho = -0.728$, $p < 0.001$).

DECLARATIONS

Ethics approval

The study was approved by the Institutional Ethics Committee of Vinayaka Missions Medical College and Hospitals, Salem (Approval No. VMKVMC&H/IEC/24/243). The study was conducted in accordance with the Declaration of Helsinki.

Consent to participate

Written informed consent was obtained from all participants before enrolment.

Consent for publication

Not applicable. No identifiable personal information or images of participants are included in this manuscript.

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Conflict of interest

The authors declare that they have no conflicts of interest.

Data availability

The de-identified dataset supporting the findings of this study is available from the corresponding author on reasonable request, subject to institutional and participant confidentiality requirements.

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Use of AI tools

An AI-based language and document-editing tool was used to assist with language polishing, organisation and formatting. The authors reviewed and verified the scientific content, statistical results, references and final manuscript and take full responsibility for the accuracy and integrity of the submitted work.

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