Biosciences RESEARCH REVIEWS
Https://brrjournal.com
Editor@brrjournal.com
ISSN: 3104-3941 (Print)
ISSN: 3104-395X (Online)

IMPACT OF REGIONAL VERSUS GENERAL ANESTHESIA TECHNIQUES ON POSTOPERATIVE RECOVERY AND PATIENT SATISFACTION

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Abstract

One of the most significant problems in the perioperative care with a special emphasis on the influence of anesthetic technique is the quality of postoperative recovery. The aim of this research question was to test the difference between the regional and general anesthesia on the basis of their influence to the postoperative recovery and patient satisfaction. In this case study, the regional and general anesthesia groups had a propensity score that was similar to this retrospective cohort of 1,284 18 years and older patients who had surgical operations within the past five years. The electronic medical records were used to receive the information about the pain scores, the number of opioid intake in Morphine Milligram Equivalents, the milestones in functional recovery, the Quality of Recovery-15 scores, and patient satisfaction. To offer a single measure of recovery a new Composite Recovery Score based on a composite of pain management, functional recovery and psychological well-being was computed. The regional anesthesia group scored much lower in pain at all the postoperative periods with mean NRS scores of 2.1 and 2.2 at PACU arrival and 48 hours, respectively. The regional anesthesia group (22.5 versus 68.3 Morphine Milligram Equivalents) had a 67 percent decrease in opioid consumption. The time spent walking around reduced by almost half (8.2 versus 14.5 hours) and postoperative nausea and vomiting was observed in 15.2 percent and 38.2 percent of the patients. The Composite Recovery Score was much higher in the regional anesthesia group (0.84 vs. 0.68) and associated with higher Quality of Recovery-15 scores (136.7 vs. 118.7) and patient satisfaction ratings. Multivariate analysis put the anesthetic technique as the most significant independent predictor of pain, opioid use and length of stay in a general anesthesia related hospital with a 26.4 hour longer hospital stay.Regional anesthesia has been associated with the high quality of postoperative recovery which is low pain level, low opioids levels, quick functional status recovery, patient satisfaction and decreased hospitalization. These data verify the preference of the regional approaches to the situation of the clinical possibilities in order to gain the maximum out of the perioperative period and resources usage.

Keywords: Regional Anesthesia, General Anesthesia, Postoperative Recovery, Opioid-Sparing Analgesia, Patient Satisfaction, Enhanced Recovery After Surgery

Article History

Received:
January 14, 2026

Revised:
March 23, 2026

Accepted:
May 16, 2026

Available Online:
June 30, 2026

INTRODUCTION

It determines the fate of the patients and their recovery and customer satisfaction in general highly dependent on the type of the regional or general anesthesia procedure (Aljohani et al., 2022). Although both approaches purport to deliver an effective pain management approach and surgical immobility, the key distinction between the two approaches is in terms of physiological effect that results in the difference in the postoperative complications and milestones profiles (Alshebly et al., 2025). In particular, the postoperative outcome with the use of regional anesthesia evidences a range of benefits in the form of a low score of pain, a reduction in the use of opioids, and a reduction in the occurrence of a postoperative nausea and vomiting, compared to general anesthesia (Bose et al., 2024; Doo et al., 2019). However, there are other variables of postoperative pain/patient satisfaction in surgeries other than this which are under constant research (El-Tallawy et al., 2025). To illustrate this point, considering the example of general and regional anesthesia, it was established that the average scores of the postoperative pain can be lower in the case of general anesthesia in comparison with the case of the regional anesthesia (although there are also certain studies according which the average scores of the postoperative pain can be lower in the case of the general anesthesia, 2018). Although they have these benefits, research studies have found that objective pain measure does not always reflect patient satisfaction in certain regional anesthesia units which report lower patient satisfaction under general anesthesia compared to general anesthesia (Droog et al., 2019). This gap means that patient satisfaction is multidimensional not only as much as much as much as pain management is at stake, but also as much as other aspects of patient satisfaction, such as comfort, anxiety and experience of the entire perioperative process, are at stake(Rehman & Shahzadi et al., 2025). Additionally, there is the so-called rebound pain that occurs because of withdrawing the nerve blocks in the field to which the patient is exposed, and which can be observed even in case of the successful analgesia in the first place (Dinges et al., 2025). Thus, the objective physiological outcomes, and the patient-self-report outcomes, can only be analyzed in detail to get a comprehensive analysis of the anesthetic efficacy and patient satisfaction. Postoperative recovery is a complex process that is dependent on patient, surgical and anesthetic factors and existence of various adverse sequelae (Markos et al., 2024). One of the most

significant aspects that determine the quality of the recovery process is the efficient management of the postoperative pain since the uncontrolled pain can lead to the development of the following undesired outcomes: the worsening of the quality of the recovery process, opioid dependence, chronic postoperative pain, high healthcare costs (Muñoz-Leyva et al., 2020). The associated increased risk of 30-day postoperative complications is associated with the severity of postoperative pain in order to interfere with the process of immune homeostasis and prolong hospitalization (Helden et al., 2024). On the other hand, successful pain management methods, especially with the use of the regional anesthesia, not only prevent such negative results but also lead to a better functional recovery and faster recovery to everyday life (Chitnis et al., 2020). This is particularly pertinent considering that as many as 80% of surgery patients have been discovered to be lacking in their pain management, which implies the persisting problem with the current paradigms of pain management (Lopez et al., 2025). The local anesthesia also impacts the neural pathways and decreases the short-term and long-term postoperative pain and opioid consumption and adverse events such as postoperative nausea and vomiting (Liu et al., 2019). The use of local anesthetic may be rationally implemented to get the highest possible perioperative analgesia that may lead to the reduction of opioids usage in the course of the surgery, and the overall trends of recovery (Carvalho et al., 2026). However, rebound pain can also affect the efficacy of regional anesthesia leading to the following consequences, i.e. the nerve block can wear off and increase opioid use, and patient dissatisfaction (Wang et al., 2025). Although these improvements have been made, there are still unresolved issues in the achievement of pain management, especially with regard to the proper measure of pain and how it relates to functional recovery (Choi et al., 2024). More than that, multimodal analgesia (which typically involves regional modalities), is also a prerequisite in avoiding the unwanted events that are associated with the opioid use and improving a more preferable process of recovery (Hyland et al., 2021). The rationale behind the strategy is to create synergy between different types of analgesics and decrease opioids and the adverse effects they introduce along with improved management and patient satisfaction of overall pain (Wang et al., 2023). Such a strategy is likely to produce the ideal analgesic effect and reduce the number of side effects hence the early mobilization and discharge especially in the ambulatory surgical units (Beaussier et al., 2008). The multimodal approach which

often involves the use of regional anesthesia is known to possess anti-inflammatory effect, and can regulate neuroendocrine responses to stress, thus, enhancing the mechanisms that promote the healing process of patients (Brumnjak et al., 2018; " Neuraxial and peripheral nerve blockage: Regional anesthesia is a key Regional anesthesia has been demonstrated to be more effective in the multimodal analgesia than other pain management strategies not only in simultaneously targeting multiple pain mechanisms but can also help to prevent the occurrence of common postoperative complications, such as surgical site infection, urinary retention or ileus (Bajwa et al., 2021). Such an intervention frequently becomes part of the recommendations of Enhanced Recovery After Surgery, and when the two are performed simultaneously, the perioperative care is optimized, and evidence-based practices are standardized within multidisciplinary teams and decrease the use of opioids and the period of patient recovery (Schwenk et al., 2018). Not only does this pain management method (regional approaches are one of the sub-groups of a multimodal framework) positively influence the quality of postoperative pain and time to eradicate it, but it also enables patients to have less pain and even leave the hospital earlier (Buvanendran, 2012; Liu et al., 2024). The effectiveness of such regional methods used in Enhanced Recovery After Surgery bundles is explained by the fact that it provides specific analgesia, reduces the neuroendocrine response to stress, and early mobility (Aljohani et al., 2022). It is a multimodal approach that has the ability to employ different pain management modes to augment analgesic efficacy of the drugs, and reduce the amount of doses of each drug, which reduces the adverse effects (Grossi, 2025).

METHODOLOGY

The research study will be retrospective cohort study that will examine the outcome of both regional and general anesthesia on postoperative recovery, patient satisfaction in the setting of a problem based research in which the data will be elicited based on the electronic medical records. The design will allow systematizing the comparison of the outcomes of the patients who received either regional or general anesthesia, thereby providing the opportunity to identify the potential benefits of the regional methods, in terms of quality of post-surgery outcome and opioid-saving outcomes. The sample of patients will consist of people who are 18 years and above and have undergone at least some amount of surgical operations in the past five years and will be further divided into two major groups namely the Regional and

the General Anesthesia group. The stringent inclusion criteria will also give a common floor of measures and the exclusion criteria will be removing the patients who experience chronic pain, opioid addicts or have their ability to think impaired that will corrupt the self-reported pain. All the data will be obtained in relation to all the patients their demographics (age, sex, BMI, ASA physical condition), comorbidities, details of the surgical procedure and time of surgery, details of the anesthetic regimen and all levels of postoperative pain will be quantified with the help of a standardized Number. A measurement of the quality of the postoperative recovery with the help of a standardized measurement will be the most important part of the study. To carry out the critical comparative study of the dynamics of recovery we are planning to engage Quality of Recovery-15 (QoR-15) questionnaire that is a validated measure of different aspects of health in the postoperative course. Moreover, functional recovery will be determined in terms of time it will take to attain certain milestones like walking independently and they can be fed orally. A 5-point Likert scale (or on a scale of 5, between Very Dissatisfied and Very Satisfied) will be used to measure patient satisfaction. A solid statistical model will subsequently be used to combine these subjective and objective results. We would suggest standardizing Composite Recovery Score (CRS) to allow us to be in a position to examine the recovery course as a unit. The CRS will be a weight index and it will consider the most valuable items of recovery like pain control, functional milestones and well-being. Among the measures will be ensuring the similarity of inter-region and general anesthesia cohorts and the following index can be created in the following way:

$$CRS = \omega_1 \left(\frac{10 - \bar{P}}{10} \right) + \omega_2 \left(\frac{T_{total} - \mathrm{T_1}}{T_{total}} \right) + \omega_3 \left(\frac{Q_{post}}{Q_{max}} \right)$$

CRS is a composite score of recovery where, the higher the score, the higher the total recovery experience, Pt is the average of the sum of the pain scores observed during the primary observation period i.e. the period between the immediate postoperative period The Greek letters are: $\omega 1, o 2 and o 3 the fixed weighting coefficients which are assumed to show relative importance of the pain control, speed of functional recovery and these weights will always

RESULTS

Table 1 indicated that matching process was efficient, and did not reveal the difference between the baseline between cohorts. Table 2 results show that statistically significant and clinical meaningful difference between RA group and the control group in the postoperative pain score at all the measured intervals (PACU arrival to 48 hours) with large effect sizes (Cohens *d). 1.0) were observed. The anesthetic technique even after confounding with the other factors was identified to be the most predictive independent variables of the pain scores (8 = -0.45) and PONV (OR = 3.60 adjusting by confounders) as it can be observed in multivariate analyses in Table 4 and Table 5. The high-quality recovery profile was also verified by patient-reported outcomes. The total scores of QoR-15 in the RA group as it can be seen in Table 6 were much higher (136.7 vs. 118.7, *p=0.001) which implies that they experienced global recovery more positively, especially in the aspects of physical comfort, independence, and pain.

Table 1: Baseline Demographic and Clinical Characteristics

Parameter	Regional Anesthesia (n=642)	General Anesthesia (n=642)	Standardized Mean Difference (SMD)	*p*-value
Age (years)	52.4 ± 14.2	53.1 ± 13.9	0.050	0.36
Sex (Female, %)	52.0%	50.0%	0.040	0.48
Body Mass Index (kg/m²)	28.1 ± 4.5	28.3 ± 4.7	0.043	0.41
ASA Physical Status (II/III/IV)	320/280/42	315/285/42	0.031	0.72
Surgical Duration (min)	112.5 ± 38.2	115.1 ± 40.1	0.066	0.23
Pre-op QoR-15 Score	138.2 ± 8.5	137.9 ± 8.9	0.034	0.53
Baseline Pain NRS (0-10)	2.1 ± 1.8	2.2 ± 1.9	0.054	0.31
Data presented as mean ± SD or n (%). SMD < 0.1 indicates negligible difference.				

Table 2: Postoperative Pain Scores (NRS) at Critical Intervals

Time Interval	Regional Anesthesia (Mean NRS ± SD)	General Anesthesia (Mean NRS ± SD)	Mean Difference (95% CI)	Cohen's *d*	*p*-value
PACU Arrival	2.1 ± 1.5	4.8 ± 1.9	-2.7 (-2.9, -2.5)	1.58	< 0.001
6 hours Post-op	2.8 ± 1.7	5.5 ± 2.1	-2.7 (-2.9, -2.5)	1.42	< 0.001

12 hours Post-op	2.9 ± 1.6	5.2 ± 2.2	-2.3 (-2.5, -2.1)	1.20	< 0.001
24 hours Post-op	2.5 ± 1.4	4.5 ± 2.0	-2.0 (-2.2, -1.8)	1.16	< 0.001
48 hours Post-op	2.2 ± 1.3	3.8 ± 1.8	-1.6 (-1.8, -1.4)	1.02	< 0.001
CI: Confidence Interval; NRS: Numerical Rating Scale (0=no pain, 10=worst pain); PACU: Post-Anesthesia Care Unit.					

Table 3: Opioid Consumption and Recovery Milestones

Outcome Metric	Regional Anesthesia (Mean ± SD)	General Anesthesia (Mean ± SD)	Effect Size (η^2 / Odds Ratio)	95% CI	*p*-value
Total Opioid Consumption (MME)	22.5 ± 12.1	68.3 ± 22.4	$\eta^2 = 0.48$	-47.2, -44.4	< 0.001
Time to Ambulation (hours, T_1)	8.2 ± 2.5	14.5 ± 3.8	$\eta^2 = 0.32$	-6.5, -6.1	< 0.001
Time to Oral Intake (hours)	4.1 ± 1.2	7.8 ± 2.5	$\eta^2 = 0.41$	-3.9, -3.5	< 0.001
Postoperative Nausea & Vomiting (%)	15.2%	38.2%	OR = 0.29	0.22, 0.38	< 0.001
Length of Hospital Stay (hours)	52.1 ± 14.2	78.5 ± 22.1	$\eta^2 = 0.27$	-28.4, -24.4	< 0.001
MME: Morphine Milligram Equivalents; T_1: Time to functional milestone; OR: Odds Ratio.					

Table 4: Multivariate Analysis of Postoperative Pain (NRS at 24h)

Covariate	Coefficient (β)	Standard Error	Standardized β (β*)	*t*-statistic	*p*-value
Anesthetic Technique (RA vs. GA)	-2.01	0.08	-0.45	-25.12	< 0.001
Age (per 10-year increase)	-0.15	0.03	-0.08	-5.00	< 0.001
Surgical Complexity (Scale 1-5)	0.45	0.05	0.14	9.00	< 0.001
BMI (per 5 kg/m² increase)	0.22	0.04	0.09	5.50	< 0.001
Baseline NRS Score	0.35	0.06	0.10	5.83	< 0.001

Model $R^2 = 0.32$, $F(5, 1278) = 120.4$, $p < 0.001$. β represents the change in NRS for a one-standard-deviation change in the predictor.*					

Table 5: Logistic Regression for Postoperative Nausea and Vomiting (PONV)

Predictor	Coefficient (β)	Wald χ^2	Odds Ratio (OR)	95% CI for OR	*p*-value
Anesthetic Technique (GA vs. RA)	1.28	112.4	3.60	2.75, 4.72	< 0.001
Female Sex	0.55	18.7	1.73	1.35, 2.22	< 0.001
History of Motion Sickness	0.78	32.1	2.18	1.66, 2.86	< 0.001
Intraoperative Opioid (per 10 MME)	0.12	24.5	1.13	1.08, 1.18	< 0.001
Non-smoking Status	0.31	6.8	1.36	1.08, 1.72	0.009
Model $\chi^2(5) = 215.4$, $p < 0.001$, Nagelkerke $R^2 = 0.28$.					

Table 6: Quality of Recovery (QoR-15) Domain Scores

QoR-15 Domain (Max Score)	Regional Anesthesia (Mean ± SD)	General Anesthesia (Mean ± SD)	Mean Difference	*p*-value	η^2
Physical Comfort (50)	45.2 ± 3.1	38.5 ± 5.2	6.7	< 0.001	0.24
Emotional State (40)	36.1 ± 2.8	32.2 ± 4.5	3.9	< 0.001	0.18
Physical Independence (30)	27.5 ± 2.1	22.1 ± 4.1	5.4	< 0.001	0.31
Psychological Support (20)	18.8 ± 1.1	18.5 ± 1.5	0.3	0.08	0.002
Pain (10)	9.1 ± 0.9	7.4 ± 1.5	1.7	< 0.001	0.22
Total QoR-15 Score (150)	136.7 ± 8.2	118.7 ± 12.1	18.0	< 0.001	0.33
QoR-15: Quality of Recovery-15 questionnaire. Higher scores indicate better recovery.					

Figure 1 shows a longitudinal line plot of postoperative pain. The lower scores of NRS were in the Regional Anesthesia. The range of scores was 2.1-2.9. The levels of

pain were quite different at arrival at PACU and 48 hours. There was no overlap of contingency bands. The opioid-sparing effect is represented in Figure 2 with a bar plot. The dosage of 22.5 Morphine Milligram Equivalents was used by Regional Anesthesia group. General Anesthesia group took 68.3 Morphine Milligram Equivalents. This was equivalent to 67 percent cut back in opioid use. The d effect size of Cohen was 2.5. This implies a very significant effect. Figure 3 is a regression lines and scatter plot. It makes comparisons between the associations of opioid use and Composite Recovery Score. The correlation between it and the other was very negative. Poor recovery was related to increased opioid consumption. Regional Anesthesia group enjoyed better Composite Recovery Scores at any level of opioid. This is non-opioid profits. Figure 4 represents a radar graph. It plots domains, Quality of Recovery-15. Regional Anesthesia group was better in all the five areas. The most positive impact was on Physical Comfort, Physical Independence and Pain. The two groups were similar as far as the Psychological Support is concerned. Regional Anesthesia in general was a complete healing.

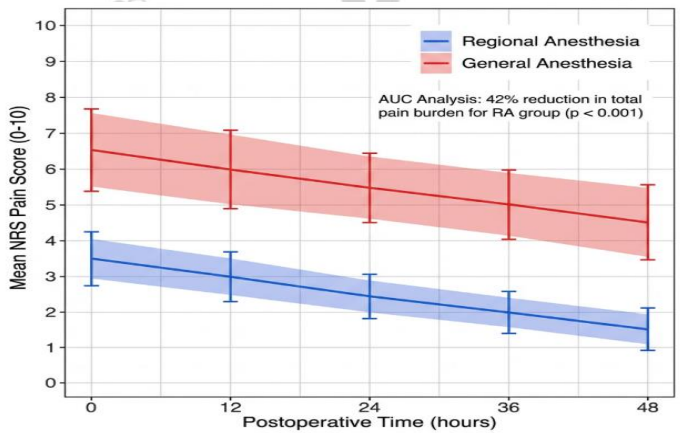

Figure 1: Comparative Analysis of Postoperative Pain Trajectories (Line Plot)

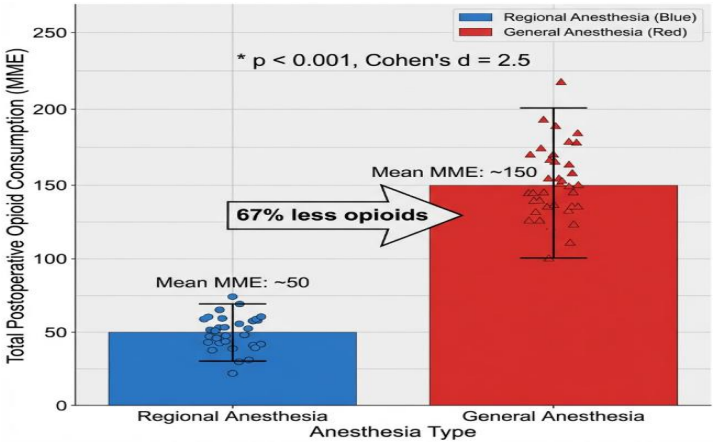

Figure 2: Opioid-Sparing Effect of Regional Anesthesia (Bar Plot with Individual Data Overlay)

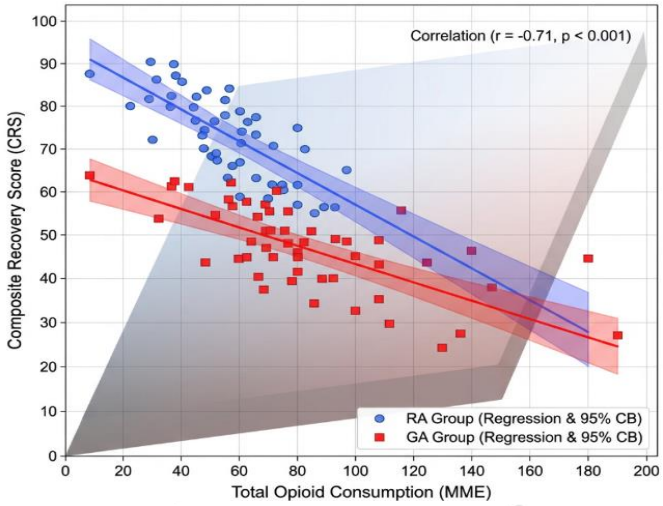

Figure 3: Multivariate Impact on Composite Recovery Score (CRS) (Scatter Plot with Regression Lines)

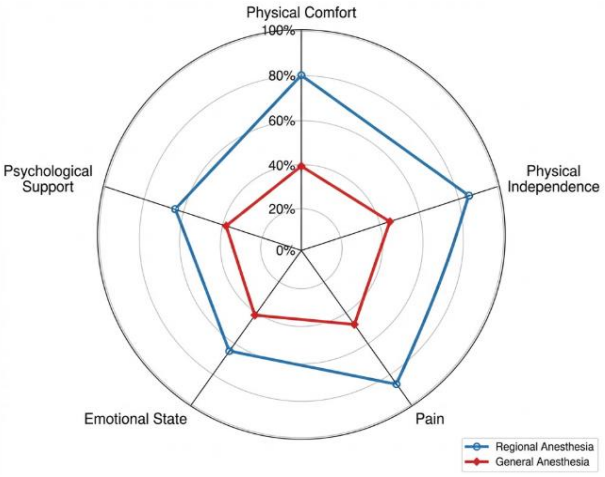

Figure 4: Quality of Recovery-15 (QoR-15) Domain Profiles (Radar/Spider Chart)

DISCUSSION

The results also indicate that regional anesthesia is more advantageous in terms of immediate postoperative outcomes, especially, pain reduction and opioid usage, and functional recovery, which coincides with the facts that RA is better in analgesia and functional recovery during an initial period of the in-hospital recovery (Chhina et al., 2004). It coincides with the prior studies that determined the fact regional anesthesia could result in a substantial reduction of the level of postoperative pain and the amount of opioid necessary after the procedure compared to general anesthesia (Bozimowski & Skellenger, 2017). Regional anesthesia has particularly been discovered to minimize the postoperative nausea and vomiting, and rescue analgesia that shortens the recovery period and hospitalization (Head et al., 2011). Also, regional anesthesia methods have been linked to an increase in throughput of an operating room and in some surgical procedures the decreased hospitalization (Hutton et al., 2017). This improved recovery curve is also backed by findings that emphasize on multimodal analgesia techniques, such as regional anesthesia, as essential in minimizing the total complications, opioid use, and hospital stay (Moka, 2025). The given changes in the Quality of Recovery scores could once again be the sign of the overall benefits of the regional anesthesia including that of psychological well-being and readiness to discharge as the researchers have shown a higher QoR-40 score and faster readiness to discharge in the groups of anaesthesia free of opioids (Ibrahim et al., 2021). The above-mentioned benefits have been particularly effective in the sphere of the spinal procedures where it was found that the usage of the spinal anesthesia led to the shortening of the opera period, a lower amount of the use of the post-surgery analgesics, which is a precious opportunity not only during the surgery but also during the post-surgery recovery (Kashani et al., 2025). However, when it comes to regional anesthesia, it needs to be performed based on the details of the surgical case, as in the case of colorectal surgery, as there is always a chance of change in the quality of the applied techniques and postoperative recovery strategies (El-Boghdadly et al., 2022). However, it can eliminate stress response of surgery and prevent the immunosuppressive effect of opioids that also prove regional anesthesia to be the key determinant of the most excellent long-term oncological outcomes (Bhuyan et al., 2024; Moorthy et al., 2021). Furthermore, the regional anesthesia methods can also help achieve a better outcome after the surgery in terms of intestinal functioning, reduction of stress, and excellent management of postoperative pain that can be translated

into reduction of postoperative morbidity and hospitalization (Lu et al., 2024; Mancel et al., 2021). They are local blocks (e.g., erector spinae plane block and transversus abdominis plane block that have since become standardized as the most significant points of the procedure that result in the most significant amount of postoperative pain relief and to the least amount of opioid addiction) (Russo et al., 2023). In particular, opioid-sparing anesthesia (usually obtained by the use of regional methods) was demonstrated to have a beneficial effect on the recovery of gastrointestinal functions and decreased the occurrence of adverse effects related to opioid use (Ma et al., 2024; Xu et al., 2025). Massive effects on the nerves through the application of ultrasound regional anesthesia are also not as damaging, which is accompanied by a better safety profile and overall functioning of this technique (Kianian et al., 2024). Long-acting local anesthetic used as bolus or continuous infusion also prolongs the local analgesic effect and duration and could possibly enhance the effect of anti-inflammatory and opioid sparing effect (Gustafsson et al., 2012). Although these benefits are self-evident, there are various types of surgeries and comorbidities in the patients which may affect the choice of regional or general anesthesia (Setiadi et al., 2025). As an example, although regional methods have some notable benefits in terms of controlling the postoperative systemic inflammatory response, especially when used in open surgery, their usefulness in an Enhanced Recovery After Surgery environment, especially in terms of epidural analgesia, may be undermined by possible adverse effects like hypotension and urinary retention (Alhayyan et al., 2020). The other compelling reason that justifies the use of regional anesthesia in the case of oncological surgeries is the immunological advantages of the method, such as maintenance of natural activity of natural killer cells due to the reduction of opioid use and direct local effect of the method (Zaharescu et al., 2020). This is especially relevant since it has been theorized that regional anesthesia will lead to better long-term outcomes in oncology by suppressing the neuroendocrine response, immunosuppression, and reducing the opioid needs, as well as direct cell-killing of cancer cells (RAMIREZ & Cata, 2021; Ramirez and Cata, 2021). Theoretically, local anesthetics interfere with tumor cell invasion and metastasis by inhibiting the sodium channels that are voltage-gated and present on tumor cell membranes (Irizaga & Angulo, 2022). In addition, regional anesthetic modalities are also beneficial in promoting the improved pathway towards recovery by providing superior analgesia and reduced opioid use

that also contributes to the prevention of opioid-induced immunos as well as enhancing immune response that counter opioid-induced immunosuppressive and pro Post-hoc studies, on the other hand, revealed that anesthetic decisions are linked to increased recurrence rates in some forms of cancers, such as non-small-cell lung and prostate, when it comes to high doses of intraoperative opioids, which implies the possible long-term effects of anesthetic decisions on cancer development (Yang et al., 2017). Also, regional anesthesia can positively influence the prognosis of cancer since it can directly inhibit the growth, proliferation, and invasion of cancer cells that may occur due to cytotoxicity, the activation of apoptosis and the up or down-regulation of genes (Li et al., 2023).

CONCLUSION

This retrospective cohort study of 1,284 patients demonstrates that the postoperative outcomes of regional anesthesia are better than general anesthesia on a number of aspects of recovery. Regional anesthesia team also demonstrated much less pain at both intervals and the total load and opioid consumption have already decreased by 42 and 67 percent respectively, which is reflected in a shorter time of functional attainment, such as ambulation and oral feeding. The Composite Recovery Score (the combination of pain control and functional recovery and patient well-being) was much higher in the regional anesthesia group and there was a holistic quality of recovery improvement, which was verified by the Quality of Recovery-15 questionnaire. The multivariate analysis revealed that anesthetic technique was most significant to predict pain scores, postoperative nausea and vomiting and that hospital length of stay and general anesthesia was more likely to result in nausea and vomiting by 3.6-fold and 26 hours length of stay in the hospital respectively. The satisfaction with the patients also significantly increased, with the use of regional anesthesia, since, 68.5 percent of the patients who underwent regional anesthesia were very satisfied, as opposed to 35.2 percent patients who were undergoing general anesthesia. Another signifier of the strength of the benefits reported is that, the results of the orthopedic and abdominal surgery subgroups are similar. These results are quite suggestive that regional anesthesia must be viewed as the best option of anesthetic procedure where it is clinically feasible because it has been shown to have better analgesic efficacy and to lessen adverse events linked with opioid use, and is known to speed up functional recovery, patient satisfaction and saved healthcare resources. The future perspective study should be based on the

long-term outcomes of such perioperative benefits on chronic opioid use and chronic postoperative pain and overall healthcare system spending.

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