International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Effect of Dexmedetomidine as an Adjuvant to Ropivacaine for Local Wound Infiltration on Postoperative Analgesia in Total Abdominal Hysterectomy: A Prospective Observational Study

Dr Anka Amin[1], Dr Junaida Sarwar[2], Dr Afshan Pervaiz[3]

[1]Associate Professor, Department of Anesthesia Critical Care Pain and Palliative Medicine, Government Medical College Srinagar, Jammu and Kashmir, India
[2]Senior Resident, Department of Anesthesia Critical Care Pain and Palliative Medicine, Government Medical College Srinagar, Jammu and Kashmir, India
[3]Resident, Department of Anesthesia Critical Care Pain and Palliative Medicine, Government Medical College Srinagar, Jammu and Kashmir, India

Corresponding Author:

Dr Afshan Pervaiz
Resident, Department of Anesthesia Critical Care Pain and Palliative Medicine, Government Medical College Srinagar, Jammu and Kashmir, India

Received: 20-01-2026
Accepted: 15-04-2026
Available online: 30-06-2026

ABSTRACT

Background: Effective postoperative pain management following total abdominal hysterectomy (TAH) remains a clinical challenge. Local wound infiltration with long-acting local anesthetics is widely used, and the addition of adjuvants like dexmedetomidine may enhance analgesic efficacy while reducing opioid consumption.

Objectives: To evaluate the quality and duration of postoperative analgesia, requirement of rescue analgesia, hemodynamic changes, and incidence of side effects following local wound infiltration with ropivacaine with and without dexmedetomidine.

Methods: This prospective observational study included 160 patients undergoing TAH under general anesthesia, divided into two groups: ropivacaine + dexmedetomidine (n=80) and ropivacaine alone (n=80). Postoperative pain was assessed using the Visual Analogue Scale (VAS) at 0, 6, 12, and 24 hours. Rescue analgesia timing, total analgesic consumption, hemodynamic parameters, and adverse effects were recorded.

Results: Baseline characteristics including ASA status (p=0.526) and comorbidities (p=0.869) were comparable. At 0 hour, 90% of patients in the dexmedetomidine group had a VAS score of 0 compared to 1.3% in the control group (p<0.001). At 6 hours, the most frequent pain score was 2 (43.8%) in the dexmedetomidine group versus 3 (40.0%) in the control group (p=0.010). At 12 and 24 hours, significantly lower pain scores persisted in the dexmedetomidine group (p<0.001). Rescue analgesia was not required in 21.3% of patients in the dexmedetomidine group compared to 2.5% in the control group (p<0.001). Total analgesic consumption of 100 mg was required in 35.0% of patients in the dexmedetomidine group versus 68.8% in the ropivacaine group (p<0.001). Hemodynamic parameters (MAP and HR) remained stable with no significant intergroup differences. The incidence of nausea (8.8% vs 22.5%, p=0.017) and vomiting (2.5% vs 16.3%, p=0.013) was significantly lower in the dexmedetomidine group. Other side effects were comparable.

Conclusion: The addition of dexmedetomidine to ropivacaine for local wound infiltration in TAH provides superior postoperative analgesia, reduces analgesic requirements, and decreases the incidence of postoperative nausea and vomiting without causing significant hemodynamic instability.

Keywords*: Dexmedetomidine; Ropivacaine; Local wound infiltration; Total*

abdominal hysterectomy; Postoperative analgesia; Visual analogue scale; Multimodal analgesia.

INTRODUCTION

Abdominal hysterectomy is one of the most commonly performed gynecological procedures worldwide, second only to cesarean section in frequency. It involves surgical removal of the uterus, with or without the adnexa, depending on the underlying pathology [1]. The procedure is indicated for a variety of conditions including uterine fibroids, endometriosis, malignancy, chronic pelvic pain, abnormal uterine bleeding, and uterine prolapse, all of which significantly impact the quality of life of affected women .

Despite its therapeutic benefits, total abdominal hysterectomy (TAH) is associated with considerable postoperative pain, which can lead to delayed recovery, prolonged hospital stay, increased healthcare costs, and higher opioid consumption. Effective postoperative pain management is therefore essential to improve patient outcomes, enhance recovery, and reduce opioid-related adverse effects [2].

Postoperative pain is a complex physiological phenomenon that can be broadly classified into nociceptive and neuropathic types. Nociceptive pain, the most common form following surgery, arises from tissue injury and inflammation, whereas neuropathic pain results from nerve damage and is often more difficult to treat [3]. Furthermore, postoperative pain can be categorized based on duration into acute and chronic pain. Acute pain typically occurs immediately after surgery and is most intense within the first 24–48 hours, while chronic postoperative pain may persist beyond the healing period and significantly impair quality of life [4,5].

The management of postoperative pain is often challenging due to variability in individual pain perception, influenced by genetic, psychological, and sociocultural factors. In addition, concerns related to opioid use, including dependence, tolerance, and adverse effects such as nausea, vomiting, and respiratory depression, further complicate pain management strategies [4,6]. These limitations have led to increasing emphasis on alternative approaches that provide effective analgesia while minimizing opioid consumption.

Multimodal analgesia has emerged as a cornerstone in postoperative pain management. This approach involves the use of multiple analgesic agents and techniques targeting different pain pathways, thereby enhancing analgesic efficacy and reducing opioid requirements and associated side effects [7,8]. Among these strategies, local anesthetic techniques play a crucial role.

Local and regional anesthesia techniques are widely used for perioperative pain control. Local anesthesia provides targeted analgesia at the surgical site without affecting consciousness, whereas regional anesthesia blocks sensation over a larger area by targeting specific nerve pathways [9,10]. Techniques such as spinal anesthesia, epidural anesthesia, and peripheral nerve blocks have been shown to provide effective postoperative analgesia and reduce opioid consumption [11,12].

Local wound infiltration (LWI) with long-acting local anesthetics has gained popularity as a simple and effective method for postoperative pain control in abdominal surgeries. It involves the direct administration of local anesthetic into the surgical wound, providing site-specific analgesia with minimal systemic effects. Ropivacaine, a long-acting amide local anesthetic, is commonly used due to its favorable safety profile and lower cardiotoxicity compared to bupivacaine [13].

The mechanism of action of local anesthetics involves reversible blockade of voltage-gated sodium channels, thereby inhibiting nerve impulse conduction and preventing transmission of pain signals to the central nervous system [14,15]. However, the duration of analgesia provided by local anesthetics alone may be limited, necessitating the use of adjuvants to prolong their effect.

In recent years, the addition of adjuvants to local anesthetics has gained significant attention as a means to enhance the quality and duration of analgesia. Among these, dexmedetomidine, a highly selective α2-adrenergic agonist, has shown promising results due to its analgesic, sedative, and opioid-sparing properties. When used as an adjuvant, dexmedetomidine prolongs the duration of analgesia, improves pain control, and reduces postoperative analgesic requirements.

Given these advantages, the present study was undertaken to evaluate the efficacy of dexmedetomidine as an adjuvant to ropivacaine for local wound infiltration in patients undergoing total abdominal hysterectomy, with a focus on postoperative analgesia, analgesic consumption, hemodynamic stability, and side effects.

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of Anesthesiology and Critical Care at Government Medical College, Srinagar, over a period of three years (2022–2025), after obtaining institutional ethical committee approval.

Study Population

A total of 160 female patients scheduled for elective total abdominal hysterectomy (TAH) under general anesthesia were included in the study.

Inclusion Criteria

- Patients aged between 40–60 years
- American Society of Anesthesiologists (ASA) physical status I and II
- Patients undergoing elective total abdominal hysterectomy under general anesthesia
- Patients providing informed written consent

Exclusion Criteria

- Known hypersensitivity to study drugs (ropivacaine or dexmedetomidine)
- Patients with significant cardiovascular, hepatic, renal, or neurological disease
- Coagulation disorders
- Chronic opioid use or history of substance abuse
- Infection at the surgical site
- Patients unwilling to participate

Study Groups

Patients were divided into two groups (n = 80 each):
Group RD (Ropivacaine + Dexmedetomidine): Received local wound infiltration with ropivacaine combined with dexmedetomidine.

Group R (Ropivacaine): Received local wound infiltration with ropivacaine alone

Anesthetic Technique

All patients were premedicated as per institutional protocol. Standard monitoring including electrocardiography (ECG), non-invasive blood pressure (NIBP), heart rate (HR), and oxygen saturation (SpO2) was instituted.

General anesthesia was administered using a standardized technique. Following induction and endotracheal intubation, anesthesia was maintained with appropriate inhalational agents and muscle relaxants.
Intervention (Local Wound Infiltration)

At the end of surgery, prior to skin closure, local wound infiltration was performed:
Group RD: Ropivacaine with dexmedetomidine
Group R: Ropivacaine alone
The study drug was infiltrated along the surgical wound in a standardized manner.

Outcome Measures

Postoperative pain assessed using the Visual Analogue Scale (VAS) at 0, 6, 12, and 24 hours post operatively.

Postoperative Analgesia Protocol

Rescue analgesia was administered when patients reported significant pain (VAS ≥ 4 as per institutional protocol). The timing and total dose of analgesics required within 24 hours were recorded.

Statistical Analysis

Data were entered and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were expressed as frequency and percentage. Chi-square test was used for categorical variables. Independent t-test was used for continuous variables. A p-value < 0.05 was considered statistically significant

RESULTS

The two groups were comparable at baseline. The distribution of ASA physical status did not differ significantly between groups (p = 0.526), and the overall burden of comorbidities was also similar (p = 0.869). Age distribution was comparable as well, with the largest proportion of patients belonging to the 41–50 years age group [Table 1].

Table 1. Baseline demographic and clinical characteristics

Variable	Ropivacaine + Dexmedetomidine (n=80)	Ropivacaine (n=80)	Total (n=160)	p-value
Age group				
< 40 years	5	5	10 (6.3%)	
41–50 years	41	41	82 (51.3%)	
51–60 years	34	34	68 (42.5%)	
ASA I	45 (56.3%)	41 (51.3%)	86 (53.8%)	0.526
ASA II	35 (43.8%)	39 (48.8%)	74 (46.3%)	0.526
Any comorbidity	44 (55.0%)	41 (51.3%)	85 (53.1%)	0.869
Hypertension	10 (12.5%)	13 (16.3%)	23 (14.4%)	0.869
Hypothyroidism	19 (23.8%)	20 (25.0%)	39 (24.4%)	0.869
Seizure disorder	1 (1.3%)	2 (2.5%)	3 (1.9%)	0.869
T2DM	6 (7.5%)	4 (5.0%)	10 (6.3%)	0.869

Postoperative pain scores were consistently lower in the dexmedetomidine group across all time points. At **0 hour**, analgesia was markedly better in the dexmedetomidine group, where **90%** of patients had a pain score of **0**, compared with only **1.3%** in the ropivacaine-only group (p < 0.001). At **6 hours**, the dexmedetomidine group still showed better pain control, with the most frequent score being **2**, whereas the ropivacaine group most commonly recorded a score of **3** (p = 0.010). By **12 hours** and **24 hours**, pain scores remained significantly lower in the dexmedetomidine group, although pain gradually increased in both groups over time.

Table 2. Postoperative pain scores by study group

Time point	Key finding in ropivacaine + dexmedetomidine group	Key finding in ropivacaine group	p-value
0 hour	72/80 (90.0%) had pain score 0	36/80 (45.0%) had pain score 1; 32/80 (40.0%) had pain score 2	<0.001
6 hours	Most common score: 2 (35/80, 43.8%)	Most common score: 3 (32/80, 40.0%)	0.010
12 hours	Most common score: 3 (38/80, 47.5%)	Most common score: 4 (35/80, 43.8%); score 5 in 22/80 (27.5%)	<0.001
24 hours	Most common score: 4 (38/80, 47.5%)	Most common score: 5 (30/80, 37.5%); score 6 in 20/80 (25.0%)	<0.001

The requirement for rescue analgesia was significantly reduced in the dexmedetomidine group. In this group, 21.3% of patients did not require rescue analgesia, compared with 2.5% in the ropivacaine-only group. Most patients in the ropivacaine group required rescue analgesia at the higher time point category, indicating greater analgesic need after plain ropivacaine infiltration (p < 0.001). Total analgesic consumption showed the same pattern, with a much larger proportion of patients in the control group requiring 100 mg or 150 mg of analgesic.

Table 3. Rescue analgesia timing and total analgesic consumption

Outcome	Ropivacaine + Dexmedetomidine (n=80)	Ropivacaine (n=80)	p-value
Rescue analgesia timing			
No rescue analgesia	17 (21.3%)	2 (2.5%)	<0.001
Time point 1	35 (43.8%)	14 (17.5%)	<0.001
Time point 2	27 (33.8%)	55 (68.8%)	<0.001
Time point 3	1 (1.3%)	9 (11.3%)	<0.001
Total analgesic consumption			
0 mg	17 (21.3%)	2 (2.5%)	<0.001
50 mg	34 (42.5%)	14 (17.5%)	<0.001
100 mg	28 (35.0%)	55 (68.8%)	<0.001
150 mg	1 (1.3%)	9 (11.3%)	<0.001

Hemodynamic parameters remained stable in both groups. Mean arterial pressure (MAP) and heart rate (HR) showed no significant intergroup difference at 0, 6, 12, or 24 hours. Oxygen saturation also remained well preserved in both groups throughout the postoperative period. A statistically significant difference in SpO2 at 12 hours was reported, but the

overall values remained within a clinically acceptable range, with most patients maintaining saturations between 96% and 99%.

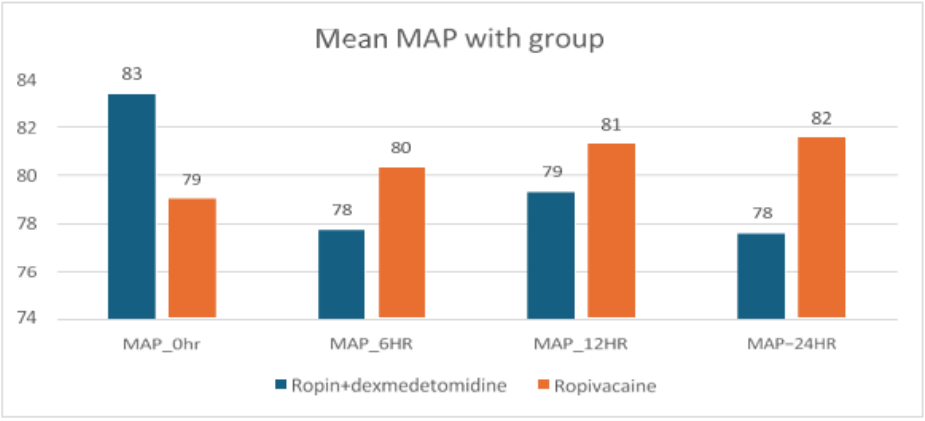

FIGURE 1. Mean arterial pressure

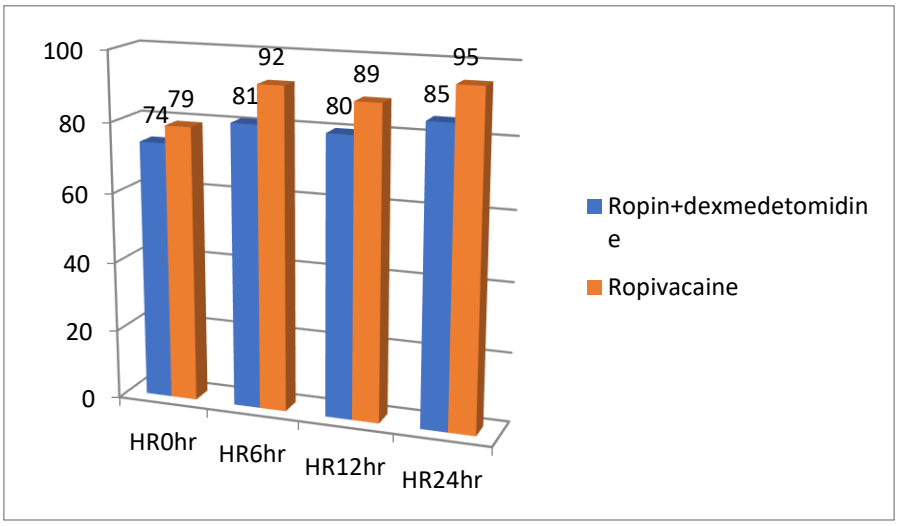

FIGURE 2. Mean heart rate among the study population

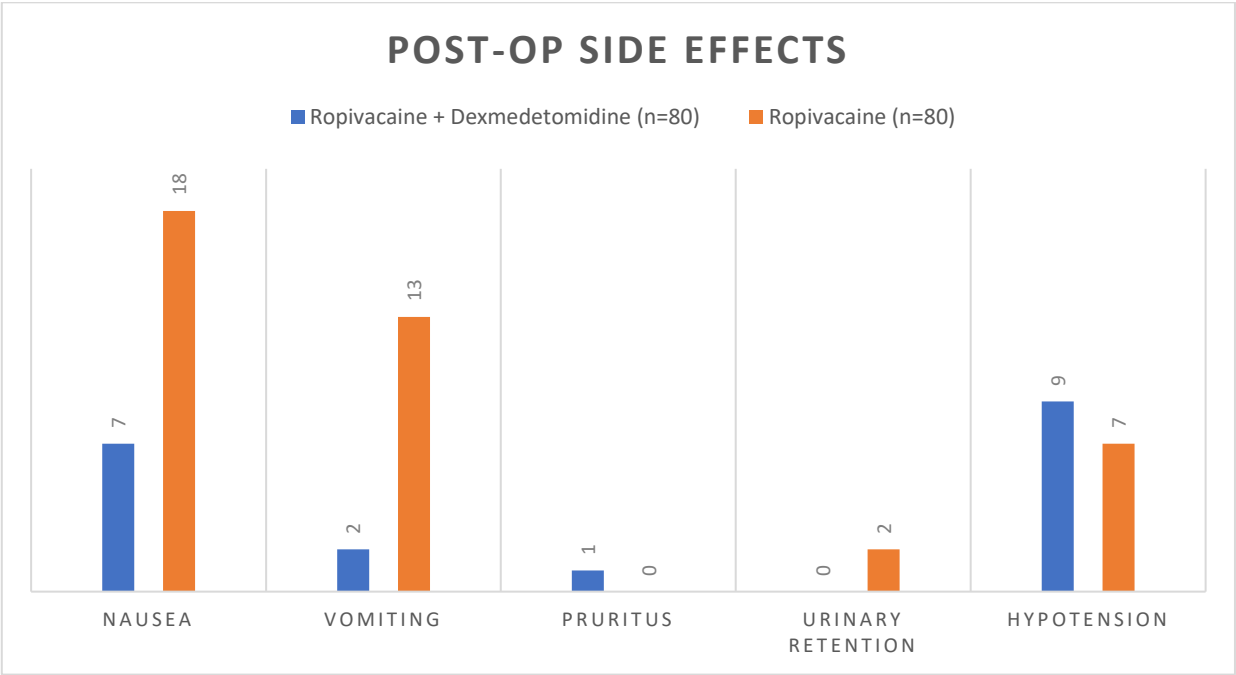

Fig 3. Post operative side effects

DISCUSSION

This study was conducted to evaluate the effect of dexmedetomidine as an adjuvant to ropivacaine for local wound infiltration in patients undergoing total abdominal hysterectomy. The findings demonstrated that the addition of dexmedetomidine significantly improved postoperative analgesia, reduced analgesic requirements, and decreased the incidence of postoperative side effects, without causing clinically significant hemodynamic instability.

The demographic characteristics in our study were comparable between the two groups. The majority of patients belonged to the 41–50 years age group, followed by 51–60 years, which is consistent with the typical age distribution for gynecological conditions requiring hysterectomy. Similar findings were reported by Swati Singh et al. [16], who observed a mean age of 48.4 years, and Reddy et al. [17], who also reported maximum distribution in the 40–50 years age group. This similarity supports the representativeness of our study population.

The ASA physical status distribution was also comparable between groups, with a predominance of ASA I patients. This is in agreement with findings reported by Swati Singh et al. [16] and Reddy et al. [17], who also demonstrated similar baseline characteristics. Such comparability strengthens the internal validity of the study and ensures that observed differences in outcomes are attributable to the intervention.

A key finding of the present study was the significantly lower postoperative pain scores in the dexmedetomidine group at all time intervals (0, 6, 12, and 24 hours). At 0 hour, 90% of patients in the dexmedetomidine group reported a pain score of 0, compared to only 1.3% in the ropivacaine group, indicating superior immediate analgesia. Even at 24 hours, pain scores remained lower in the dexmedetomidine group, suggesting prolonged analgesic effect.

These findings are consistent with Almarakbi et al. [18], who demonstrated prolonged time to first analgesic request and reduced opioid consumption with dexmedetomidine in TAP blocks. Similarly, Luan et al. [19] reported reduced sufentanil consumption and PCA use in patients receiving dexmedetomidine, especially in the early postoperative period. Although their study showed comparable pain scores, the reduced analgesic requirement aligns with our findings of superior analgesia.

The results of Swati Singh et al. [16], who evaluated wound infiltration, are particularly comparable to our study. They reported significantly lower pain scores and reduced morphine requirement in the dexmedetomidine group, closely mirroring our observations. Likewise, Hengfei Luan et al. [19] demonstrated that dexmedetomidine potentiated the analgesic effect of ropivacaine and reduced opioid consumption without affecting wound healing.

Further support is provided by Shaman Bhardwaj et al. [20], who reported improved VAS scores and reduced rescue analgesia in cesarean section patients receiving dexmedetomidine. Similarly, S A Mohamed et al. [21] observed delayed analgesic requirement and improved pain control with dexmedetomidine infiltration, reinforcing its analgesia-prolonging effect.

In the present study, the requirement and timing of rescue analgesia differed significantly between the two groups. A notable proportion (21.3%) of patients in the dexmedetomidine group required no rescue analgesia, compared to only 2.5% in the control group. Additionally, the need for analgesia was delayed in the dexmedetomidine group, indicating prolonged duration of action.

These findings are in agreement with Almarakbi et al. [18], who reported prolonged time to first analgesic request, and Luan et al. [19], who observed reduced early postoperative analgesic demand. Similar observations were made by Swati Singh et al. [16], Hengfei Luan et al. [19], and Shaman Bhardwaj et al. [20], all of whom demonstrated reduced and delayed analgesic requirement with dexmedetomidine.

Total analgesic consumption was significantly lower in the dexmedetomidine group, with a higher proportion of patients requiring minimal or no analgesics, while the ropivacaine group required higher doses. This highlights the opioid-sparing effect of dexmedetomidine.

Comparable findings were reported by Shaman Bhardwaj et al. [20], Almarakbi et al. [18], and Luan et al. [19], who all demonstrated reduced postoperative opioid consumption with dexmedetomidine. Similarly, Swati Singh et al. [16] and Hengfei Luan et al. [19] reported reduced analgesic requirements, further validating our results. Studies by Deshwal et al. [22], Bansal et al. [23], and Mohamed et al. [21] also support the analgesic-sparing role of dexmedetomidine across different surgical settings.

Hemodynamic parameters remained stable in both groups throughout the study period. There were no statistically significant differences in heart rate or mean arterial pressure at any time point. This suggests that local infiltration of dexmedetomidine does not result in significant systemic absorption or cardiovascular effects.

This observation is consistent with Swati Singh et al. [16], who reported no significant hemodynamic changes. Almarakbi et al. [18] noted a mild decrease in heart rate without clinical significance, while Reddy et al. [17] observed minor fluctuations that did not require intervention. Similarly, Madangopal et al. [24] reported some variability at higher doses, but without clinical consequences. These findings collectively confirm the hemodynamic safety of dexmedetomidine when used locally.

Regarding postoperative side effects, the incidence of nausea and vomiting was significantly lower in the dexmedetomidine group, likely due to reduced opioid consumption. Other side effects such as pruritus, urinary retention, and hypotension were comparable between groups and not statistically significant.

These findings are supported by Swati Singh et al. [16], who also reported fewer side effects in the dexmedetomidine group. Luan et al. [19] found no significant increase in adverse effects, while Bansal et al. [23] and Deshwal et al. [22] confirmed improved analgesia without increased complications. Additionally, Shelwatkar et al. [25] and Reddy et al. [17] reported similar safety profiles, further supporting the tolerability of dexmedetomidine.

Overall, the findings of the present study demonstrate that dexmedetomidine is an effective and safe adjuvant to ropivacaine for local wound infiltration. It provides superior postoperative analgesia, reduces analgesic consumption, delays the need for rescue analgesia, and minimizes opioid-related side effects, without causing significant hemodynamic disturbances.

CONCLUSION

The present study demonstrates that the addition of dexmedetomidine to ropivacaine for local wound infiltration in total abdominal hysterectomy significantly enhances postoperative analgesic outcomes. Patients receiving dexmedetomidine exhibited markedly superior pain control, with 90% reporting a VAS score of 0 at 0 hours, compared to only 1.3% in the ropivacaine-only group. This analgesic benefit persisted over time, with consistently lower pain scores observed at 6, 12, and 24 hours.

Importantly, the use of dexmedetomidine resulted in a substantial reduction in analgesic requirements. 21.3% of patients required no rescue analgesia, and a majority required only minimal doses, whereas most patients in the control group required higher analgesic consumption, with 68.8% needing 100 mg of rescue analgesia. These findings clearly highlight the analgesic-sparing and opioid-sparing effect of dexmedetomidine.

In addition, the dexmedetomidine group demonstrated a significantly lower incidence of postoperative nausea (8.8% vs 22.5%) and vomiting (2.5% vs 16.3%), reflecting improved overall patient comfort and recovery profile. Despite its pharmacological profile, dexmedetomidine did not produce any clinically significant hemodynamic instability, with mean arterial pressure and heart rate remaining comparable between the two groups throughout the study period.

In conclusion, dexmedetomidine, when used as an adjuvant to ropivacaine for local wound infiltration, provides prolonged and effective postoperative analgesia, reduces analgesic consumption, and improves patient outcomes without compromising safety. Its incorporation into multimodal analgesic protocols for abdominal hysterectomy can be considered a simple, safe, and highly effective strategy to optimize postoperative pain management.

Conflict of interest: Nil
Funding: Nil

REFERENCES

1. Aarts JW, Nieboer TE, Johnson N, Tavender E, Garry R, Mol BW, Kluivers KB. Surgical approach to hysterectomy for benign gynaecological disease. *Cochrane Database Syst Rev.* 2015;8:CD003677.
2. Garimella V, Cellini C. Postoperative pain control. *Clin Colon Rectal Surg.* 2013;26(3):191–196.
3. Butterworth JF IV, Mackey DC, Wasnick JD. *Morgan & Mikhail's Clinical Anesthesiology.* 7th ed. New York: McGraw-Hill; Year.
4. Gupta A, Kaur K, Sharma S, Goyal S, Arora S, Murthy RS. Clinical aspects of acute postoperative pain management and its assessment. *J Adv Pharm Technol Res.* 2010;1(2):97–108.
5. Schug SA, Lavand'homme P, Barke A, Korwisi B, Rief W, Treede RD; IASP Taskforce for the Classification of Chronic Pain. The IASP classification of chronic pain for ICD-11: chronic postsurgical or posttraumatic pain. *Pain.* 2019;160(1):45–52.

6. Shafi S, Collinsworth AW, Copeland LA, et al. Association of opioid-related adverse drug events with clinical and cost outcomes among surgical patients in a large integrated health care delivery system. *JAMA Surg.* 2018;153(8):757–763.
7. Beverly A, Kaye AD, Ljungqvist O, Urman RD. Essential elements of multimodal analgesia in enhanced recovery after surgery (ERAS) guidelines. *Anesthesiol Clin.* 2017;35(2):e115–e143.
8. Zhou J, Fan Y, Zhong J, Wen X, Chen H. Efficacy and safety of multimodal analgesic techniques for preventing chronic postsurgical pain under different surgical categories: a meta-analysis. *Sci Rep.*2017;7:678.
9. Pratheeba N, Remadevi R, Raajesh IJ, et al. Comparison of postoperative analgesic efficacy of wound site infiltration and ultrasound-guided transversus abdominis plane block with 0.5% ropivacaine in lower abdominal surgeries under spinal anesthesia. *Anesth Essays Res.*2018;12:80–84.
10. Weinstein EJ, Levene JL, Cohen MS, Andreae DA, Chao JY, Johnson M, Hall CB, Andreae MH. Local anaesthetics and regional anaesthesia versus conventional analgesia for preventing persistent postoperative pain in adults and children. *Cochrane Database Syst Rev.* 2018;6:CD007105.
11. Chattopadhyay I, Jha AK, Banerjee SS, Basu S. Post-procedure adhesive arachnoiditis following obstetric spinal anaesthesia. *Indian J Anaesth.* 2016;60(5):372–374.
12. Salicath JH, Yeoh EC, Bennett MH. Epidural analgesia versus patient-controlled intravenous analgesia for pain following intra-abdominal surgery in adults. *Cochrane Database Syst Rev.* 2018;8:CD010434.
13. Grape S, Kirkham KR, Albrecht E. Transversus abdominis plane block versus local anaesthetic wound infiltration for analgesia after caesarean section: a systematic review and meta-analysis with trial sequential analysis. *Eur J Anaesthesiol.* 2022;39(3):244–251.
14. Wang GK, Strichartz GR. State-dependent inhibition of sodium channels by local anesthetics: a 40-year evolution. *Biochem (Mosc) Suppl Ser A Membr Cell Biol.* 2012;6(2):120–127.
15. Kuthiala G, Chaudhary G. Ropivacaine: a review of its pharmacology and clinical use. *Indian J Anaesth.* 2011;55(2):104–110.
16. Singh S, Choudhary NK, Lalin D, Verma VK. Postoperative analgesic effect of dexmedetomidine added to bupivacaine for wound infiltration following abdominal hysterectomy. *J Clin Diagn Res.* 2017;11(6):UC01–UC04.
17. Reddy SR,Bhat R , Gayatri CK , Sholapur I. Effect of Dexmedetomidine as an Adjuvant to Ropivacaine in Transversus Abdominis Plane Block for PostoperativeAnalgesia in Patients Undergoing Abdominal Hysterectomy. International Journal of Pharmaceutical and Clinical Research 2024; 16(1); 909-919.
18. Almarakbi WA, Kaki AM. Addition of dexmedetomidine to bupivacaine in transversus abdominis plane block prolongs postoperative analgesia after abdominal hysterectomy. *Saudi J Anaesth.* 2014;8(2):161–166.
19. Luan H, Zhang J, Huang J, et al. Effect of dexmedetomidine added to ropivacaine in ultrasound-guided transversus abdominis plane block for postoperative analgesia after abdominal hysterectomy. *J Clin Anesth.*2016;34:255–260.
20. Bhardwaj S, Devgan S, Sood D, et al. Comparison of ropivacaine with and without dexmedetomidine for local wound infiltration in cesarean section. *J Clin Diagn Res.* 2017;11(8):UC05–UC08.
21. Mohamed SA, Sayed DM, El Sherif FA, Abd El-Rahman AM. Effect of wound infiltration with ketamine versus dexmedetomidine on postoperative pain and stress response after abdominal hysterectomy. *Egypt J Anaesth.* 2018;34(2):83–90.
22. Deshwal R, Yadav M, Gupta S, et al. Efficacy of dexmedetomidine as an adjuvant to ropivacaine for wound infiltration in lumbar discectomy. *Anesth Essays Res.* 2018;12(3):694–698.
23. Bansal P, Baduni N, Bhalla J, Mahawar B. Dexmedetomidine as an adjuvant to ropivacaine in transversus abdominis plane block for cesarean section. *J Clin Anesth.*2018;45:75–79.
24. Madangopal S, Ramesh VJ, et al. Comparative evaluation of different doses of dexmedetomidine as an adjuvant to local wound infiltration for postoperative analgesia. *Indian J Anaesth.* 2020;64(5):412–418.
25. Shelwatkar S, Patil V, et al. Effect of dexmedetomidine added to bupivacaine for wound infiltration in abdominal hysterectomy. *J Anaesthesiol Clin Pharmacol.* 2019;35(2):242–247.