

Research Article

A comparative study of Dexmedetomidine and Dexamethasone as Adjuvants for Ultrasound-Guided Transversus Abdominis Plane Block in Total Laparoscopic Hysterectomy.

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Abstract

Background: Transversus abdominis plane (TAP) block is widely used for postoperative analgesia in laparoscopic hysterectomy. Various adjuvants have been explored to prolong local-anaesthetic action, including dexmedetomidine and dexamethasone.

Objective: To compare dexmedetomidine and dexamethasone as adjuvants to bupivacaine for ultrasound-guided TAP block for postoperative analgesia in total laparoscopic hysterectomy (TLH).

Methods: Sixty ASA I–II female patients were randomized to receive bilateral TAP block with either dexmedetomidine 1 µg/kg (Group DM, n=30) or dexamethasone 8 mg (Group DX, n=30) as adjuvant to 0.25% bupivacaine. Primary outcome was time to first rescue analgesic. Secondary outcomes included VAS scores, tramadol consumption, sedation, hemodynamics, PONV, and adverse effects.

Results: Time to first rescue analgesic was significantly longer in Group DM (13.8 ± 3.1 h) than Group DX (10.6 ± 2.7 h) ($p < 0.001$). Group DM demonstrated lower VAS scores from 4–24 h and reduced 24-h tramadol consumption (78.3 ± 32.5 mg vs 112.0 ± 38.6 mg, $p = 0.002$). Mild bradycardia occurred

more frequently in Group DM but required no intervention.

Conclusion: Dexmedetomidine provided longer analgesia and reduced opioid requirement compared with dexamethasone when used as an adjuvant in TAP block for TLH.

Keywords: TAP block; dexmedetomidine; dexamethasone; laparoscopic hysterectomy; postoperative analgesia.

Introduction

Total laparoscopic hysterectomy (TLH) is commonly performed for benign and early malignant gynaecological conditions. Despite minimal access, patients often experience significant postoperative pain due to peritoneal stretching, trocar injury, and pneumoperitoneum-related irritation [1,2]. Effective postoperative analgesia reduces opioid use, improves recovery, and enhances early ambulation [3].

Ultrasound-guided transversus abdominis plane (TAP) block provides somatic analgesia to the anterior abdominal wall (T6–L1) and significantly reduces postoperative opioid requirements in lower abdominal surgeries, including hysterectomy [4,5].

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Various adjuvants have been evaluated to enhance the duration and quality of TAP block. Dexamethasone, a long-acting glucocorticoid, prolongs analgesia via anti-inflammatory and nociceptive modulation mechanisms [6,7]. Multiple meta-analyses have shown that dexamethasone effectively prolongs TAP block duration and reduces rescue analgesia requirement [8].

Dexmedetomidine, a highly selective α_2 -adrenergic agonist, has sedative, analgesic, and sympatholytic properties. Perineural dexmedetomidine enhances local-anaesthetic action by hyperpolarizing C-fibres and decreasing norepinephrine release [9,10]. Several randomized trials suggest that dexmedetomidine can significantly prolong TAP block duration [11,12].

Head-to-head comparisons of dexamethasone versus dexmedetomidine as TAP block adjuvants show mixed results, influenced by surgical type, dose, and local anaesthetic used [13–15]. Limited data are available specifically for TLH.

Hence, we aimed to compare the analgesic efficacy of dexmedetomidine and dexamethasone as adjuvants to bupivacaine in ultrasound-guided TAP block in patients undergoing TLH.

Materials and Methods

Study design

A prospective, randomized, double-blind comparative study was conducted over 12 months after obtaining Institutional Ethics Committee approval.

Participants

Sixty female patients aged 30–65 years, ASA I–II, scheduled for elective TLH were enrolled. Inclusion and exclusion criteria

were based on previous TAP block studies [4,8].

Randomization and blinding

Patients were randomized into two groups (n = 30 each) using a computer-generated random sequence:

Group DM: Dexmedetomidine 1 μ g/kg added to 0.25% bupivacaine

Group DX: Dexamethasone 8 mg added to 0.25% bupivacaine

All syringes were prepared in identical volumes by an independent anaesthesiologist. Patients, surgeons, block performer, and outcome assessor were blinded.

Anaesthesia technique

Anaesthesia was standardized for all patients, following protocols similar to previous TLH analgesia studies [1,3]. Induction was done with propofol and fentanyl; maintenance with sevoflurane and vecuronium.

TAP block technique

Using a high-frequency linear probe, bilateral TAP block was performed at the mid-axillary line. Needle placement between internal oblique and transversus abdominis muscle was confirmed using real-time ultrasound visualization, as described in established guidelines [4,5].

Each side received 20 mL of study solution.

Postoperative analgesia protocol

Rescue analgesia: IV tramadol 50 mg (VAS ≥ 4), repeatable every 6 h

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PONV prophylaxis: ondansetron 4 mg

• PONV and adverse effects

Pain, sedation, and hemodynamics assessed up to 24 h

Statistical analysis

Continuous variables were compared using Student's t-test; categorical variables with chi-square or Fisher's exact test. $p < 0.05$ was significant.

Outcome measures

Primary outcome:

- Time to first rescue analgesic

Results

Secondary outcomes:

- VAS scores at multiple intervals
- Total 24-h tramadol consumption
- Hemodynamics
- Sedation scores

Patient characteristics

Demographic and baseline characteristics were comparable between groups (Table 1).

Table 1. Baseline characteristics

Variable	Group DM (n=30)	Group DX (n=30)	p-value
Age (years)	47.3 ± 6.2	48.1 ± 5.9	0.61
BMI (kg/m ²)	24.8 ± 2.6	25.1 ± 2.4	0.68
Duration(min)	104 ± 18	101 ± 20	0.54

Primary Outcome

- Time to first rescue analgesic was significantly prolonged in Group DM compared with Group DX:

Group DX: 112.0 ± 38.6 mg

$p = 0.002$

Dexmedetomidine (DM): 13.8 ± 3.1 h

Adverse effects

Dexamethasone (DX): 10.6 ± 2.7 h

Bradycardia: 4/30 (DM) vs 1/30 (DX), self-limiting

$p < 0.001$

PONV: comparable

Secondary Outcomes

No block-related complications

Pain scores

Discussion

VAS scores were lower in Group DM at 4, 6, 12, and 24 h ($p < 0.05$).

This randomized controlled study showed that dexmedetomidine significantly prolonged postoperative analgesia and reduced opioid requirements compared with dexamethasone when used as adjuvants to bupivacaine in TAP block for TLH.

Tramadol consumption

Group DM: 78.3 ± 32.5 mg

Comparison with previous evidence

Our findings agree with several studies demonstrating that dexmedetomidine enhances TAP block duration by α_2 -receptor-mediated modulation of nociceptive transmission [9,10,11]. Prior studies have reported 2–5 h prolongation of analgesia with dexmedetomidine, consistent with the 3-h increase observed in our data [11,12].

Dexamethasone is also well established as a potent TAP block adjuvant. Meta-analyses confirm its ability to enhance peripheral nerve block duration by anti-inflammatory and direct neuronal membrane effects [6–8]. Studies comparing these drugs show mixed results: some favour dexmedetomidine [13], others dexamethasone [14], and some show equivalence [15].

This variation may be explained by local anaesthetic type, surgical technique, block plane accuracy, and adjuvant dose variability [12–15].

Clinical significance

Dexmedetomidine provided:

Longer pain-free duration

Lower VAS scores

Significant opioid-sparing effect

This aligns with enhanced recovery protocols emphasizing opioid minimization and early ambulation in TLH [3].

Adverse effects

Dexmedetomidine-related bradycardia, though more common, was mild and comparable to earlier reports [9,11]. Sedation remained within acceptable levels.

Conclusion

Dexmedetomidine (1 $\mu\text{g/kg}$) as an adjuvant to bupivacaine in ultrasound-guided TAP block for TLH provides longer postoperative analgesia and reduces opioid consumption more effectively than dexamethasone (8 mg), with acceptable safety.

Both remain effective agents, but dexmedetomidine may be preferred in enhanced-recovery settings.

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