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Original Research Article

Comparative Evaluation of Dexmedetomidine versus Buprenorphine as Adjuvants to Isobaric Levobupivacaine and Hyperbaric Bupivacaine in Segmental Thoracic Spinal Anaesthesia for Total Laparoscopic Hysterectomy: A Randomized Controlled Clinical Trial

Dinesh Vallabhbhai Ghoghari[1], Ankitkumar Dhanjibhai Desai[2], Dhruva Sanjay Savani[3]

[1,2]Associate Professor, Department of Anaesthesia, Kiran Medical College, Surat, Gujarat, India
[3]Assistant Professor, Department of Anaesthesia, Kiran Medical College, Surat, Gujarat, India

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Corresponding author: Dr. Dinesh Vallabhbhai Ghoghari
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Abstract

Background: Total laparoscopic hysterectomy (TLH) performed under neuraxial anesthesia must be performed with a sufficient sensory block (T4-L1) and with a stable hemodynamics and with a minimal motor block. Site specific blockade is achieved with segmental thoracic spinal anesthesia (STSA). The relative effectiveness of the use of dexmedetomidine in combination with isobaric levobupivacaine or hyperbaric bupivacaine, however, is poorly studied.

Objective: To compare the block characteristics, hemodynamic stability, postoperative analgesia and adverse effect profile of dexmedetomidine and buprenorphine with isobaric levobupivacaine 0.5% versus hyperbaric bupivacaine 0.5% in segmental spinal anesthesia for TLH.

Methods: This was a prospective, randomized, double blind study of 120 adult women (ASA physical status I/II, aged 35–60 years) undergoing elective TLH, who were divided into four groups (n = 30 each): Group LD (levobupivacaine 7.5 mg + dexmedetomidine 5 µg), Group LB (levobupivacaine 7.5 mg + buprenorphine 60 µg), Group BD (hyperbaric bupivacaine 7.5 mg + dexmedetomidine 5 µg), and Group BB (hyperbaric bupivacaine 7.5 mg + buprenorphine 60 µg). Sensory/motor blockade onset, time to first analgesic request, 24-hour rescue tramadol consumption, hemodynamics, and complications were noted.

Results: The onset of peak sensory block at T4 was fastest in Group BD (4.8 ± 0.9 min) compared to Group LD (6.1 ± 1.1 min), Group BB (5.4 ± 1.0 min), and Group LB (6.8 ± 1.2 min; $p < 0.001$). Duration of effective analgesia was significantly longer in the dexmedetomidine groups than in the buprenorphine groups, with Group LD and Group BD having durations of 486.5 ± 42.8 min and 498.2 ± 46.1 min, respectively, compared to 394.6 ± 38.4 min in Group LB and 408.1 ± 41.2 min in Group BB ($p < 0.001$). Twenty-four-hour tramadol consumption was lowest in Group LD (60.0 ± 25.4 mg) and Group BD (55.0 ± 22.8 mg) versus Group LB (95.0 ± 32.1 mg) and Group BB (90.0 ± 28.6 mg; $p < 0.001$). Complete motor recovery was significantly quicker with levobupivacaine (LD: 178.4 ± 24.2 min; LB: 165.2 ± 20.8 min) compared to hyperbaric bupivacaine (BD: 242.6 ± 28.5 min; BB: 230.1 ± 26.4 min; $p < 0.001$). Group LD had more hemodynamic stability and lower vasopressor usage than Group BD ($p = 0.024$).

Conclusion: Dexmedetomidine offers superior prolongation of postoperative analgesia and opioid-sparing effects compared to buprenorphine. Dexmedetomidine combined with isobaric levobupivacaine provides optimal surgical conditions, excellent hemodynamic stability and also provides a significant motor recovery in TLH, so it is the preferred combination in segmental spinal anesthesia in TLH.

Keywords: Segmental Spinal Anesthesia; Total Laparoscopic Hysterectomy; Levobupivacaine; Hyperbaric Bupivacaine; Dexmedetomidine; Buprenorphine; Postoperative Analgesia.

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Introduction

Total laparoscopic hysterectomy (TLH) has become the preferred minimally invasive surgical approach for benign uterine diseases, and provides improved functional recovery, lower surgical site morbidity, and shorter hospital stays than laparotomy [1]. Laparoscopic gynecological procedures have traditionally been performed under general anesthesia with intubation and controlled mechanical ventilation to counteract the diaphragmatic splinting and physiological changes

caused by steep Trendelenburg positioning and CO2 pneumoperitoneum [2]. General anesthesia, however, is often associated with postoperative nausea and vomiting (PONV), emergent emergence delirium and significant parenteral opioid consumption [3].

In the last decade, the use of segmental thoracic spinal anesthesia (STSA) has become popular and safe for upper and lower abdominal surgeries, including laparoscopy [4]. STSA is performed by placing low dose local anesthetic in the thoracic subarachnoid space (usually between T9 and T11), which results in a dermatomal hypesthesia (T4 to L1) without lower extremity motor power loss or lumbar and sacral parasympathetic block [5]. This regional anaesthetic effect reduces the intense vasodilatory effect in the lower limbs, which therefore maintains the venous return and cardiac pre-load much better than a conventional lumbar spinal anaesthetic [6].

The standard of reference for subarachnoid bupivacaine injection remains hyperbaric bupivacaine, because it is known to spread predictably according to its density and to produce a reliable surgical block [7]. Its pure S-enantiomer congener, however, has a greater safety margin with less cardiotoxicity and neurotoxicity profiles, and a different sensory-to-motor dissociation that promotes early postoperative ambulation [8]. However, low doses of local anaesthetic used in the segmental protocol can provide inadequate sensory ceiling, visceral peritoneal discomfort during the operation due to traction on the diaphragm and early postoperative pain without the use of an appropriate adjuvants [9].

Lipophilic adjuvants are commonly used in conjunction with the analgesic, and are used to optimize block dynamics and to increase the analgesic corridor [10]. Dexmedetomidine is a highly selective alpha-2 adrenergic agonist that extends sensory and motor blockade by hyperpolarizing interneurons in the substantia gelatinosa (Rexed lamina II) and inhibiting the release of pro-inflammatory nociceptive peptides [11]. Buprenorphine, a high-affinity partial mu-opioid receptor agonist and kappa-opioid receptor antagonist, has long-acting spinal opioid receptor-mediated analgesia without late respiratory depression seen with hydrophilic opioids [12].

There are no direct comparisons of the pharmacodynamic characteristics of intrathecal dexmedetomidine and buprenorphine in spinal anesthesia combined with isobaric levobupivacaine versus hyperbaric bupivacaine in thoracic segmental spinal anesthesia for TLH. There are no direct comparisons of the pharmacodynamic characteristics of intrathecal dexmedetomidine and buprenorphine in spinal anesthesia combined with isobaric levobupivacaine versus hyperbaric bupivacaine in thoracic segmental spinal anesthesia for TLH. This double-blinded, randomized controlled trial aimed to compare the time to onset, dermatomal spread, motor block resolution, hemodynamics, and duration of analgesia between dexmedetomidine and buprenorphine with isobaric levobupivacaine and hyperbaric bupivacaine in patients undergoing TLH.

Materials and Methods

Study Design: A total of 120 adult female patients aged 35-60 years, ASA physical status I or II, undergoing elective total laparoscopic hysterectomy for benign indications (such as symptomatic leiomyoma, adenomyosis, and dysfunctional uterine bleeding that is unresponsive to medical management) were enrolled.

Exclusion Criteria:

- Refusal or failure to understand the visual analogue scale (VAS).
- Body mass index (BMI) ≥ 35 kg/m^2.
- Contraindications to neuraxial blockade (local cutaneous infection at puncture site, pre-existing coagulopathy, severe uncorrected hypovolemia, raised intracranial pressure).
- A history of severe cardiac valvular disease, baseline bradycardia (heart rate < 50 bpm) or high-grade atrioventricular conduction block.
- Prior neurological deficits, spinal deformities or surgery to the thoracolumbar spine.
- Hypersensitivity to local anesthetics, alpha-2 agonists or opioids.
- Cases that needed to be converted to open laparotomy or cases that lasted more than 150 minutes.

Randomization and Blinding: Patients who enrolled were randomly assigned to the four groups (n = 30) using a computer-generated random number sequence and sequentially numbered opaque envelopes.

Group LD: Isobaric levobupivacaine 0.5% (7.5 mg, 1.5 mL) + Dexmedetomidine 5 µg (0.1 mL of preservative-free solution diluted in 0.4 mL normal saline) = total volume 2.0 mL.

Group LB: Isobaric levobupivacaine 0.5% (7.5 mg, 1.5 mL) + Buprenorphine 60 µg (0.2 mL diluted in 0.3 mL normal saline) = total volume 2.0 mL.

Group BD: Hyperbaric bupivacaine 0.5% (7.5 mg, 1.5 mL) + Dexmedetomidine 5 µg (0.5 mL solution) = total volume 2.0 mL.

Group BB: Hyperbaric bupivacaine 0.5% (7.5 mg, 1.5 mL) + Buprenorphine 60 µg (0.5 mL solution) = total volume 2.0 mL.

Drug preparation was carried out by an independent anesthesiologist who was not responsible for patient management, outcome assessment or data recording. The operating anesthesiologist, surgical team, postoperative nursing staff and patients were all strictly blinded to group allocation.

Anesthetic Procedure: Preoperative assessment consisted of a baseline cardiovascular examination, an examination of the airway, and habituation to the 10-point Visual Analogue Scale (0 = no pain, 10 = worst imaginable pain). Patients were all fasted overnight and preloaded with 10 mL/kg of balanced crystalloid solution intravenously 15 minutes prior to the block. Continuous electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry (SpO), and end-tidal capnography (EtCO) by nasal cannula were initiated. With strict aseptic technique, the patient in a sitting position with the head flexed, the T10-T11 intervertebral space was identified by palpation with the lower tip of the scapula (T7 spinous process) as an anatomical landmark. A 26 gauge pencil point Whitacre spinal needle was inserted through a median approach after local infiltration with 2 mL of 2% lignocaine. The subarachnoid space was confirmed by free, clear flow of cerebrospinal fluid (CSF). The mixture of anesthetics (2.0 mL) was injected slowly (0.2 mL/s) without barbotage. Patients were immediately placed in a supine position with neutral spine after injection.

Oxygen (4 L/min) was given via a simple facemask. Carbon dioxide insufflation was used to create pneumoperitoneum, and the pressure was kept at a ceiling of 10–12 mmHg at the automated intra-abdominal pressure. After establishing fixed sensory blockade, the operating table was positioned in a moderate Trendelenburg position (15–20 degrees). Only for patient anxiety and shoulder tip discomfort due to diaphragmatic irritation, intravenous sedation with midazolam (1–2 mg) and fentanyl (0.5–1 µg/kg) was used.

Intraoperative and Postoperative Assessments: Sensory Block: Assessed every 2 minutes for first 20 minutes, and then every 15 minutes intraoperatively with a short-bevel 24 gauge needle (pinprick test). Parameters recorded were: time to onset of sensory blockade at T10, peak sensory blockade level, time to peak sensory blockade level, time to two dermatome sensory regression and total duration of sensory blockade (regression to T12).

Motor Block: Assessed bilaterally, Modified Bromage Scale (0 = no motor impairment; 1 = unable to raise extended leg, flex knee and ankle; 2 = unable to flex knee, flex ankle; 3 = complete motor paralysis of lower extremity). Motor block was assessed at 5, 10, 15 and 30 minutes and then at 30-minute intervals after surgery until Bromage 0 (full recovery).

Hemodynamic Variables: Heart rate (HR), mean arterial pressure (MAP) and 〖"SpO" 〗_2 were recorded at baseline, post-block at 5, 10, 15, 30, 45, 60, 90 and 120 minutes and into the post-anesthesia care unit (PACU). Hypotension (defined as a reduction of MAP > 20% from baseline or absolute systolic BP < 90 mmHg) was treated with intravenous ephedrine (6 mg bolus). Bradycardia (HR < 50 bpm) was treated with intravenous atropine (0.5 mg bolus).

Analgesic Profile: VAS score was measured at 1, 2, 4, 6, 8, 12 and 24 hours after surgery. When the VAS score was ≥ 4, rescue analgesia (tramadol 100 mg slow infusion) was given. Time to first analgesic request and total 24-hour tramadol use was measured.

Adverse Events: Respiratory depression (〖"SpO" 〗_2 < 92%), pruritus, shivering, sedation (using Ramsay Sedation Scale), transient neurological symptoms (TNS), and PONV.

Statistical Analysis: The sample size was powered using primary outcome data (duration of effective sensory analgesia). With an alpha error of 0.05 and 80% power to detect a minimum clinically meaningful difference of 45 minutes in the duration of analgesia between four groups with an anticipated standard deviation of 40 minutes, 26 patients were calculated to be required in each group. Thirty patients were allocated to each arm (N = 120) to offset the possibility of dropouts or procedural conversions.

The Shapiro-Wilk test was used to check the normality of continuous data, which were then reported as Mean ± Standard Deviation (SD). One-way Analysis of Variance (ANOVA) was used for between-group comparisons and Tukey's post hoc test was performed for multiple pairwise comparisons.

Medians with interquartile ranges were used for non-normally distributed or ordinal variables and the Kruskal-Wallis test was used for analysis. Categorical variables were expressed as frequencies and percentages (%), and analyzed by Chi-square (χ^2) test or Fisher's exact test. Statistically significant was defined as a p-value < 0.05. Data were analyzed by SPSS version 26.0 (IBM Corp., Armonk, NY).

Results

A total of 120 patients were successfully enrolled, randomized, and completed the trial protocol across the four arms without any technical failure of segmental dural puncture or conversion to general anesthesia. Baseline demographic characteristics—

including age, weight, height, BMI, ASA physical status distribution, and total duration of surgery—were comparable among all four study groups, confirming baseline comparability ($p > 0.05$ across all parameters).

Table 1: Baseline Demographic and Surgical Characteristics of the Study Cohort

Variable	Group LD (n = 30)	Group LB (n = 30)	Group BD (n = 30)	Group BB (n = 30)	p-value
Age (years)	46.2 ± 5.8	47.1 ± 6.2	45.8 ± 5.4	46.9 ± 5.9	0.812
Weight (kg)	62.4 ± 7.1	63.8 ± 6.9	61.9 ± 7.5	64.2 ± 7.3	0.548
Height (cm)	158.3 ± 5.2	157.6 ± 4.8	159.1 ± 5.0	158.0 ± 4.9	0.635
BMI (kg/m²)	24.9 ± 2.4	25.7 ± 2.6	24.4 ± 2.3	25.7 ± 2.5	0.124
ASA Status (I / II)	18 / 12 (60% / 40%)	17 / 13 (56.7% / 43.3%)	19 / 11 (63.3% / 36.7%)	16 / 14 (53.3% / 46.7%)	0.865
Surgical Duration (min)	98.4 ± 14.6	102.1 ± 16.2	96.8 ± 15.1	100.5 ± 15.8	0.521
Pneumoperitoneum Time (min)	82.5 ± 12.3	85.0 ± 13.8	80.9 ± 12.7	84.2 ± 13.1	0.618

Sensory and Motor Block Characteristics: The onset of sensory block at the T10 dermatome and time to peak sensory block were significantly accelerated in the hyperbaric bupivacaine cohorts (BD and BB) relative to the isobaric levobupivacaine cohorts (LD and LB; $p < 0.001$).

The peak sensory level reached across all four groups was T4 (range T4–T6), which was adequate for laparoscopic surgery under pneumoperitoneum.

Sensory regression of two dermatomes and total duration of sensory block were significantly prolonged in the dexmedetomidine groups (LD and BD) compared to the buprenorphine groups (LB and BB; $p < 0.001$). Regarding motor blockade, patients receiving hyperbaric bupivacaine demonstrated a substantially higher incidence of dense motor block (Modified Bromage 2 or 3) and prolonged motor blockade compared to those receiving isobaric levobupivacaine.

Patients in Group LD and Group LB exhibited minimal motor impairment (Bromage 0 or 1 in 83.3% and 86.7% of subjects, respectively) and achieved complete motor recovery (Bromage 0) in 178.4 ± 24.2 min and 165.2 ± 20.8 min, respectively, compared to 242.6 ± 28.5 min in Group BD and 230.1 ± 26.4 min in Group BB ($p < 0.001$).

Table 2: Comparison of Sensory and Motor Block Dynamics

Parameter	Group LD (n = 30)	Group LB (n = 30)	Group BD (n = 30)	Group BB (n = 30)	p-value
Sensory Onset at T10 (min)	3.2 ± 0.6	3.5 ± 0.7	2.4 ± 0.5	2.6 ± 0.6	< 0.001*
Time to Peak Block (min)	6.1 ± 1.1	6.8 ± 1.2	4.8 ± 0.9	5.4 ± 1.0	< 0.001*
Peak Sensory Level [Median (IQR)]	T4 (T4–T5)	T4 (T4–T6)	T4 (T3–T4)	T4 (T4–T5)	0.142
Two-Dermatome Regression (min)	134.8 ± 14.5	110.2 ± 12.8	142.1 ± 16.2	116.5 ± 13.9	< 0.001*
Sensory Duration to T12 (min)	328.6 ± 28.4	265.4 ± 24.1	345.2 ± 31.0	278.9 ± 26.5	< 0.001*
Max Bromage Scale [0 / 1 / 2 / 3] (%)	43 / 40 / 17 / 0	47 / 40 / 13 / 0	3 / 17 / 57 / 23	7 / 20 / 53 / 20	< 0.001*
Time to Motor Recovery: Bromage 0 (min)	178.4 ± 24.2	165.2 ± 20.8	242.6 ± 28.5	230.1 ± 26.4	< 0.001*

Postoperative Analgesia and Consumption: The time elapsed to the first request for rescue analgesia was longest in Group BD (498.2 ± 46.1 min) and Group LD (486.5 ± 42.8 min), which were comparable to each other ($p = 0.428$) but significantly longer than in Group BB (408.1 ± 41.2 min) and Group LB (394.6 ± 38.4 min; $p < 0.001$). Total cumulative tramadol requirement over 24 hours postoperatively was significantly reduced in the dexmedetomidine-treated cohorts relative to the buprenorphine cohorts (LD: 60.0 ± 25.4 mg; BD: 55.0 ± 22.8 mg vs. LB: 95.0 ± 32.1 mg; BB: 90.0 ± 28.6 mg; $p < 0.001$).

Table 3: Postoperative Analgesic Profile, Hemodynamics, and Adverse Effects

Outcome Parameter	Group LD (n = 30)	Group LB (n = 30)	Group BD (n = 30)	Group BB (n = 30)	p-value
Time to 1st Analgesic Request (min)	486.5 ± 42.8	394.6 ± 38.4	498.2 ± 46.1	408.1 ± 41.2	< 0.001*
24-hr Tramadol Consumption (mg)	60.0 ± 25.4	95.0 ± 32.1	55.0 ± 22.8	90.0 ± 28.6	< 0.001*
Intraoperative Hypotension, n (%)	3 (10.0%)	4 (13.3%)	10 (33.3%)	8 (26.7%)	0.042*
Intraoperative Bradycardia, n (%)	5 (16.7%)	1 (3.3%)	6 (20.0%)	2 (6.7%)	0.089
Total Ephedrine Requirement (mg)	1.8 ± 3.4	2.2 ± 4.1	6.8 ± 6.2	5.4 ± 5.8	< 0.001*
PONV, n (%)	2 (6.7%)	7 (23.3%)	1 (3.3%)	8 (26.7%)	0.016*
Pruritus, n (%)	0 (0.0%)	4 (13.3%)	0 (0.0%)	5 (16.7%)	0.024*
Shivering, n (%)	1 (3.3%)	3 (10.0%)	2 (6.7%)	4 (13.3%)	0.485
Ramsay Sedation Score > 3, n (%)	6 (20.0%)	1 (3.3%)	7 (23.3%)	2 (6.7%)	0.038*

Hemodynamics and Complications: Hypotension was observed more frequently in the hyperbaric bupivacaine groups (Group BD: 33.3%, Group BB: 26.7%) compared to the isobaric levobupivacaine groups (Group LD: 10.0%, Group LB: 13.3%; $p = 0.042$), requiring a significantly higher mean ephedrine dose in the bupivacaine arms ($p < 0.001$). Intraoperative bradycardia occurred slightly more often in patients receiving dexmedetomidine (LD: 16.7%; BD: 20.0%) compared to buprenorphine, but all episodes responded promptly to a single 0.5 mg dose of atropine.

The incidence of PONV and pruritus was significantly higher in both buprenorphine cohorts (LB and BB) than in the dexmedetomidine cohorts ($p < 0.05$). Mild, easily arousable sedation (Ramsay Sedation Score of 3 or 4) was observed in 20.0% of Group LD and 23.3% of Group BD patients, which was well tolerated and reduced intraoperative anxiety. No patient experienced respiratory depression, persistent post-dural puncture headache (PDPH), or transient neurological symptoms during the 72-hour postoperative period.

Discussion

The aim of this prospective, randomized clinical trial was to compare the clinical pharmacodynamics of two intrathecal adjuvants (dexmedetomidine and buprenorphine) in combination with either isobaric levobupivacaine or hyperbaric bupivacaine in patients who received segmental thoracic spinal anesthesia for total laparoscopic hysterectomy.

The results of our study show that dexmedetomidine can be used to achieve longer postoperative analgesia and decrease cumulative opioid consumption over 24 hours than buprenorphine. Additionally, isobaric levobupivacaine provided sensory coverage that was comparable to hyperbaric bupivacaine, but had greater hemodynamic stability and significantly faster motor recovery in the lower extremity.

The goal of segmental thoracic spinal anesthesia is to target the local anesthetic molecules to the mid-to-lower thoracic spinal nerve roots (T4–L1) without unnecessary sacral and lower lumbar blockade [13]. Visceral afferent impulses are generated during laparoscopic gynecological surgery by pneumoperitoneum and uterine manipulation, and travel to T10–L1 via sympathetic nerves, while the pain signals from diaphragmatic peritoneal distention ascend to C3–C5 through phrenic afferents [14].

A dense sensory ceiling (T4) will prevent discomfort from stretching the peritoneum. All four groups had a median peak sensory block height of T4 in our study. The onset to T10 and peak sensory height with hyperbaric bupivacaine, however, were about 1.5 minutes faster than isobaric levobupivacaine. This difference is due to the relative density of hyperbaric solutions, which allows rapid gravity-assisted distribution in the thoracic kyphotic curvature when the patient is in the supine or slight Trendelenburg position [15].

Dexmedetomidine demonstrated significantly longer duration of sensory block (two dermatome regression times) and a wider analgesia window (486.5 min in LD and 498.2 min in BD) than the buprenorphine groups (394.6 min in LB and 408.1 min in BB). Intrathecal dexmedetomidine works synergistically with local anesthetics by inhibiting the propagation of nociceptive C-fiber and A-delta signals through presynaptic inhibition of voltage-gated calcium channels and activation of postsynaptic inwardly rectifying potassium currents in substantia gelatinosa neurons [16].

Buprenorphine also binds to spinal mu-opioid receptors with high affinity and its partial agonistic activity and slower dissociation kinetics resulted in shorter sensory block duration than dexmedetomidine. Buprenorphine also had higher incidence of opioid-related side effects, such as pruritus (13.3% to 16.7%) and PONV (23.3% to 26.7%). These comparative advantages of dexmedetomidine over lipophilic opioids for longer pain-free periods and fewer emetic sequelae have been reported in other abdominal and pelvic surgical procedures [17].

One of the main benefits of using isobaric levobupivacaine in ambulatory or short-stay surgical pathways is that it has a decreased affinity for motor nerve fibers compared with racemic bupivacaine. We found that more than 80% of patients who received isobaric levobupivacaine had preserved or near-normal motor power in the lower extremity (Modified Bromage 0 or 1), whereas most of those who received hyperbaric bupivacaine had dense motor power in the lower extremity (Bromage 2 or 3).

Furthermore, complete motor resolution was obtained about 65 minutes sooner in the levobupivacaine groups. The principles of modern Enhanced Recovery After Surgery (ERAS) protocols [18] are the rapid recovery of motor function in the lower limbs, which decreases the risk of positional nerve compressions, facilitates early post-surgical mobilization and decreases the risks of deep vein thrombosis.

In hemodynamics, segmental spinal anesthesia is used to achieve a sympathetic block of the splanchnic circulation while maintaining vascular tone in the lower extremities. The incidence of hypotension (30.0% pooled) and the amount of vasopressor used were significantly higher in the hyperbaric bupivacaine group than in the isobaric levobupivacaine group.

The isobaric preparation restricts the distribution of the local anesthetic to the thoracic injection site and does not allow the local anesthetic to spread down into the lower lumbar sympathetic fibers and lumbosacral roots [8, 13]. Bradycardia was mild and easily managed by atropine and was not associated with any long-term hemodynamic instability.

There are some limitations to this study. First, although clinical endpoints were well documented, we did not measure serum catecholamines or neuroendocrine stress markers (e.g. cortisol or interleukin-6) to quantify systemic stress response between groups. Second, the clinical assessment of diaphragmatic irritation during pneumoperitoneum was done without objective diaphragmatic ultrasonography.

Further studies with various doses of isobaric levobupivacaine and ultrasound-guided thoracic spinal access will further optimize this technique for minimally invasive gynecological surgery.

Conclusion

Dexmedetomidine is more effective than buprenorphine as an adjuvant for segmental thoracic spinal anesthesia for total laparoscopic hysterectomy, resulting in prolonged postoperative analgesia, reduced opioid use for rescue pain, and fewer side effects such as nausea and pruritus. In combination with isobaric levobupivacaine, it offers good sensory anesthesia, hemodynamic stability and quick onset of motor recovery. This is a good, patient-centred anaesthetic approach for laparoscopic gynaecology surgery.

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