
GYNAECOLOGY

Local Wound Infiltration of Bupivacaine with Dexamethasone versus Bupivacaine Alone for Postoperative Pain after Total Abdominal Hysterectomy: A randomized controlled trial

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ABSTRACT

Objectives: To assess the effectiveness of adding dexamethasone to bupivacaine for local wound infiltration in reducing postoperative pain post total abdominal hysterectomy (TAH) for benign gynecologic conditions.

Materials and Methods: A double-blind, randomized controlled trial enrolled women undergoing TAH for benign gynecologic conditions. All participants received local wound infiltration with 20 mL of 0.5% bupivacaine (100 mg). The intervention group additionally received 8 mg of dexamethasone, while the control group received normal saline. Postoperative pain was assessed using a 10-cm visual analogue scale (VAS) at 2 (baseline), 6, 12, 18, and 24 hours postoperatively. Data were analyzed using a linear mixed model. A p value < 0.05 was considered statistically significant.

Results: Fifty-two participants (26 per group) were enrolled between November 2024 and April 2025. Within-group analysis demonstrated a statistically significant reduction in VAS scores over time ($p < 0.05$). Between-group comparison showed significantly lower VAS scores at 12 hours postoperatively in the intervention group compared to the control group (4.3 ± 1.0 vs 5.9 ± 1.3 , mean difference 1.6; 95% CI (0.33, 2.23), $p = 0.009$). There were no significant differences observed in total postoperative morphine consumption (12.7 ± 3.2 mg vs 13.6 ± 3.1 mg, $p = 0.313$) or adverse events between the groups.

Conclusion: Addition dexamethasone to bupivacaine for local wound infiltration significantly decreased postoperative pain following TAH for benign gynecologic conditions, with a notable difference at 12 hours compared to bupivacaine alone. However, there was no clinical difference in postoperative morphine use.

Keywords: local anesthesia, postoperative pain, bupivacaine, dexamethasone, hysterectomy.

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การฉีดยาชาบупิวาเคนร่วมกับยาเดกซาเมทาโซนรอบแผลผ่าตัด เทียบกับการใช้ยาชาบупิวาเคนเพียงอย่างเดียวต่อการระบับปวดหลังผ่าตัดมดลูกทางหน้าท้อง: การทดลองแบบสุ่มและมีกลุ่มควบคุม

ณัฏกานต์ ด่านชัย, วีรพล ศรีนิล, สุกัญญา ศรีนิล

บทคัดย่อ

วัตถุประสงค์: เพื่อประเมินประสิทธิภาพของการใช้ยาเดกซาเมทาโซนร่วมกับยาชาบупิวาเคนในการฉีดรอบแผลผ่าตัดเพื่อลดอาการปวดหลังผ่าตัดมดลูกทางหน้าท้องในโรคทางนรีเวชที่ไม่ใช่มะเร็ง

วัสดุและวิธีการ: เป็นการศึกษาแบบสุ่มและมีกลุ่มควบคุม โดยอาสาสมัครผู้เข้าร่วมวิจัยและผู้วิจัยไม่ทราบชนิดของยาทดลองที่ได้รับ ผู้เข้าร่วมวิจัยคือสตรีที่เข้ารับการผ่าตัดมดลูกทางหน้าท้องและได้รับการฉีดยาร้อยละ 0.5 ของบупิวาเคนปริมาณ 20 มล. (100 มก.) บริเวณแผลผ่าตัด โดยกลุ่มทดลองจะเพิ่มยาเดกซาเมทาโซนขนาด 8 มก. ผสมในยาชา ในขณะที่กลุ่มควบคุมได้รับน้ำเกลือแทนการให้ยาเดกซาเมทาโซน การประเมินความปวดหลังผ่าตัดทำโดยใช้มาตรวัดความปวดยาว 10 ซม. (visual analogue scale: VAS) ที่ 2 (ค่าเริ่มต้น), 6, 12, 18 และ 24 ชั่วโมงหลังการผ่าตัด ทำการวิเคราะห์ข้อมูลโดยใช้โมเดลเชิงเส้นแบบผสม (linear mixed model) และกำหนดค่านัยสำคัญทางสถิติที่ $p < 0.05$

ผลการศึกษา: มีผู้เข้าร่วมวิจัยทั้งหมด 52 ราย (กลุ่มละ 26 ราย) ระหว่างเดือนพฤศจิกายน พ.ศ. 2567 ถึงเมษายน พ.ศ. 2568 ผลการวิเคราะห์ค่าแตกต่างความปวดภายในแต่ละกลุ่มพบว่าคะแนน VAS ลดลงอย่างมีนัยสำคัญทางสถิติทุกช่วงระยะเวลาที่ทำการศึกษา ($p < 0.05$) เมื่อเปรียบเทียบค่าความปวดระหว่างกลุ่ม พบว่าที่ 12 ชั่วโมงหลังผ่าตัด กลุ่มทดลองมีคะแนน VAS ต่ำกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (4.3 ± 1.0 vs 5.9 ± 1.3 , ค่าความต่างเฉลี่ย 1.6, 95% CI 0.33, 2.23, $p = 0.009$) อย่างไรก็ตาม ไม่พบความแตกต่างอย่างมีนัยสำคัญระหว่างกลุ่มในเรื่องปริมาณการใช้ยาฉีดมอร์ฟีนหลังผ่าตัด (12.7 ± 3.2 mg vs 13.6 ± 3.1 mg, $p = 0.313$) หรือการเกิดเหตุการณ์ไม่พึงประสงค์

สรุป: การเพิ่มยาเดกซาเมทาโซนในยาชาบупิวาเคนสำหรับการฉีดรอบแผลผ่าตัด สามารถลดความปวดหลังผ่าตัดมดลูกทางหน้าท้องได้อย่างมีนัยสำคัญทางสถิติที่ 12 ชั่วโมงหลังการผ่าตัดเมื่อเทียบกับการใช้ยาชาบупิวาเคนเพียงอย่างเดียว แต่อย่างไรก็ตามยังไม่พบความแตกต่างทางคลินิกเนื่องจากปริมาณการใช้ยาฉีดมอร์ฟีนหลังผ่าตัดไม่แตกต่างกัน

คำสำคัญ: การระบับความรู้สึกเฉพาะที่, ความปวดหลังผ่าตัด, บุปิวาเคน, เดกซาเมทาโซน, การผ่าตัดมดลูก

Introduction

Inappropriately managed postoperative pain can cause serious, life-threatening complications such as deep vein thrombosis and postoperative pneumonia due to delayed ambulation. It also raises the risk of high-dose morphine use and its side effects, including nausea, vomiting, constipation, and sedation, all of which can negatively impact the hospital experience⁽¹⁾.

Effective postoperative pain management is therefore essential for reducing the occurrence of these complications. Numerous studies have explored different methods for managing postoperative pain following abdominal surgery⁽²⁻⁶⁾. Systematic reviews have shown that multimodal pain management—using two or more analgesic agents with different mechanisms of action—is more effective than standard morphine-based patient-controlled analgesia (PCA)^(7,8). Consistent with this evidence, the 2023 Enhanced Recovery After Surgery (ERAS) guideline for gynecologic oncology recommends multimodal pain management, with local anesthesia such as bupivacaine commonly employed⁽⁹⁻¹²⁾.

Bupivacaine, an amide-type local anesthetic first introduced in 1957, is widely used for regional anesthesia and postoperative pain management. Its primary mechanism of action involves the voltage-gated sodium channel on the nerve cell membrane, thereby preventing neuronal depolarization⁽¹³⁾. The maximum recommended adult dose is 2 mg/kg (up to 175 mg without adrenaline). It begins working after approximately 15 minutes, has a half-life of 2.7 hours, and provides analgesia for 2–8 hours. Bupivacaine is metabolized in the liver and excreted by the kidneys⁽¹⁴⁾.

Multiple studies have demonstrated that bupivacaine local infiltration effectively reduces postoperative pain in procedures such as cesarean section, vaginal hysterectomy, and abdominal hysterectomy for benign and oncologic conditions. However, despite its efficacy, the relatively short

duration of bupivacaine action limits prolonged pain relief⁽¹⁴⁻¹⁷⁾.

Dexamethasone is a potent glucocorticoid with strong anti-inflammatory properties. As a lipophilic molecule, it readily diffuses across the cell membrane and binds to the glucocorticoid receptor in the cytoplasm, leading to the production of anti-inflammatory proteins. Furthermore, its stabilizers, lysosomal and cell membranes, prevent the release of proteolytic enzymes and reduce capillary leakage, frequently used as an adjuvant in surgical analgesia. Dexamethasone has a rapid onset, with peak plasma concentration at 1-2 hours, a terminal half-life of approximately 4 hours, and a long-lasting effect of 36–72 hours^(18,19). Reported postoperative adverse effects, including wound infection, wound dehiscence, delayed wound healing, wound hematoma and glycemic disturbance, are minimal⁽²⁰⁾. Intravenous dexamethasone reduces pain scores, reduces opioid use, and extends the time to first analgesia in abdominal surgery, though evidence for subcutaneous wound infiltration remains limited⁽²¹⁾. Clinical studies in cesarean section, laparoscopic cholecystectomy, craniotomy, and total knee arthroplasty suggest that combining dexamethasone with local anesthetics enhances and extends analgesia⁽²²⁻²⁶⁾.

Hysterectomy is the most common gynecologic operation worldwide⁽²⁷⁾ and is also frequently performed at Khon Kaen Hospital, with approximately 300 cases annually. The procedure may be performed by laparotomy or laparoscopy, using either transabdominal or transvaginal approaches. To date, few studies have evaluated the efficacy of bupivacaine and dexamethasone for wound infiltration during total abdominal hysterectomy for benign gynecologic conditions^(7-8,12). Therefore, this study aimed to evaluate the effectiveness of adding dexamethasone to bupivacaine for postoperative pain management following total abdominal hysterectomy (TAH) in this patient population.

Materials and Methods

This double-blinded randomized controlled trial was conducted at the Department of Obstetrics and Gynecology at Khon Kaen Hospital between November 2024 and April 2025. The research received ethical review and approval from the Khon Kaen Hospital Institute Review Board in Human Research (reference number: KEF67013) and was registered in Thai Clinical Trial Registry (reference number: TCTR20251005002) prior to the commencement of the study.

Women diagnosed with benign gynecologic conditions and scheduled for an abdominal hysterectomy with or without adnexal surgery were screened for eligibility. Inclusion criteria included: (a) women aged 18-65 years, (b) body weight over than 50 kg, (c) ASA physical status I-II. Exclusion criteria included, (d) allergy to bupivacaine or another amide-type local anesthetic, (e) allergy to dexamethasone, (f) severe underlying diseases such as chronic kidney disease stage 3, severe heart disease, poorly controlled diabetic mellitus, active or chronic liver disease, or poorly controlled asthma, (g) inability to understand Thai, (h) obesity (body mass index, BMI > 30 kg/m²), (i) intraoperative complications such as bowel mucosal tear, or (j) malignancy, according to the study, which focused on total abdominal hysterectomy for benign gynecologic conditions. Participants with intraoperative findings suspicious of malignancy were also excluded.

Eligible patients provided written informed consent prior to enrollment. They were randomly assigned to two groups using a computer-generated sequence with a block size of four, with allocation concealed in consecutively numbered envelopes.

Anesthesia was induced with propofol (1.5-2.5 mg/kg), and muscle relaxation was achieved with atracurium (0.5 mg/kg) or cisatracurium (0.1 mg/

kg). Following endotracheal intubation, anesthesia was maintained with sevoflurane or desflurane, nitrous oxide, and oxygen. Supplemental doses of propofol, atracurium, and intravenous morphine were administered as clinically indicated.

Total abdominal hysterectomy was performed using a standard technique. The type of incision, whether low midline or Pfannenstiel, and the length of the incision, which was measured before wound infiltration, were recorded.

Before skin closure, a blinded physician drew an envelope to determine group allocation. An assistant prepared identical, colorless syringes containing either 0.5% bupivacaine 100 mg (20 ml) with 8 mg of dexamethasone (2 ml) for the intervention group, or 0.5% bupivacaine 100 mg (20 ml) with 2 ml of normal saline for the control group. All solutions were prepared by a pharmacist to ensure masking. A total of 22 ml of the study solution was infiltrated into the subcutaneous tissue only, with no infiltration into the fascia or muscle layers, immediately prior to starting subcutaneous wound closure. The volume was divided equally, with 11 ml infiltrated along each side of the incision (left and right, corresponding to the superior and inferior wound edges), using a 24 G (38 mm) needle. Aspiration was performed prior to injection to avoid accidental intravascular administration.

All patients received standard perioperative and postoperative care. Postoperative pain was managed with intravenous morphine 3 mg every 4 hours during the first 12 hours, with additional 3-mg intravenous morphine doses administered as needed for visual analogue scale (VAS) scores $\geq$ 5 thereafter⁽²⁸⁾. Pain was assessed by attending nurses using a 0-10 VAS, where 0 indicated no pain and 10 indicated the worst imaginable pain, and scores were recorded at 2 (baseline), 6, 12, 18, and 24 hours postoperatively. Antibiotics were

administered for 24 hours following surgery. Patients were encouraged to ambulate on the first postoperative day. They followed a standard diet progression, starting with liquids at 12 hours, advancing to a soft meal the next day, and then to a regular diet as tolerated afterwards.

The primary outcome was post-operative pain at 12 hours. This time point was selected because bupivacaine's action typically lasts 2–8 hours; thus, postoperative pain at 12 hours was selected as the primary outcome for three main reasons. First, because bupivacaine's action lasts approximately 2–8 hours, assessing pain at 12 hours helps determine if dexamethasone effectively extends the analgesic effect beyond the duration of the local anesthetic alone. Second, the first 12 hours post-surgery are clinically critical for patient recovery⁽⁹⁾. Effective pain management during this period is essential to facilitate early ambulation and reduce postoperative complications, such as lung atelectasis, by improving the patient's ability to breathe deeply and cough effectively. Lastly, the previous studies^(22,23) at 12 hours postoperatively reported significantly different pain scores. Secondary outcomes included post-operative pain at 2 (baseline), 6, 18, and 24 hours, morphine consumption, postoperative nausea and vomiting (PONV), patient satisfaction scores recorded on a 0-10 numerical scale (0 = not satisfied, 10 = highly satisfied) at the time of hospital discharge, surgical wound complications such as hematoma, infection and separation, and length of hospital stay.

The sample size was determined using G*Power software (version 3.1.9.4.). The calculation was based on a repeated-measures analysis of variance (ANOVA) with a within-between interaction design to compare postoperative pain scores between two groups across five time points (2, 6, 12, 18, and 24 hours). Parameters for the sample

size calculation were informed by pilot postoperative VAS pain scores at 12 hours, which was the primary outcome time point that demonstrated the largest between-group difference.

In the pilot study, mean $\pm$ standard deviation VAS scores were 4.3 ± 1.2 in the intervention group and 5.6 ± 1.3 in the control group, indicating a mean difference of 1.3 units. Based on these findings, a medium effect size (Cohen's $f = 0.25$) was conservatively assumed for the repeated-measures ANOVA model, in line with Cohen's criteria. The correlation among repeated measures was assumed to be 0.5, with the no sphericity correction set to 1. Using an alpha level of 0.05, a power of 90%, two groups, and five repeated measurements, the required sample size was 46 participants. To account for an anticipated 10% dropout rate, the final sample size was increased to 52 participants (26 per group).

Continuous data were analyzed using Student's t-test and reported as mean $\pm$ standard deviation. Categorical data were analyzed using chi-squared or Fisher's exact tests and reported as percentages. Pain scores over time (2, 6, 12, 18, and 24 hours) were analyzed using a linear mixed-effects model. Statistical significance was set at $p < 0.05$. Analyses were performed using R software version 4.4.1.

Results

A total of 302 women were assessed for eligibility to undergo a TAH with or without adnexal surgery for benign gynecologic conditions. Of these, 302 individuals provided informed consent, 250 women were excluded, 143 due to not meet criteria, 99 due to refuses to participant, Seven due to intraoperative finding of malignancy, and one due to bowel mucosal tear. As a result, 52 participants were randomized into the intervention and control groups (Fig. 1).

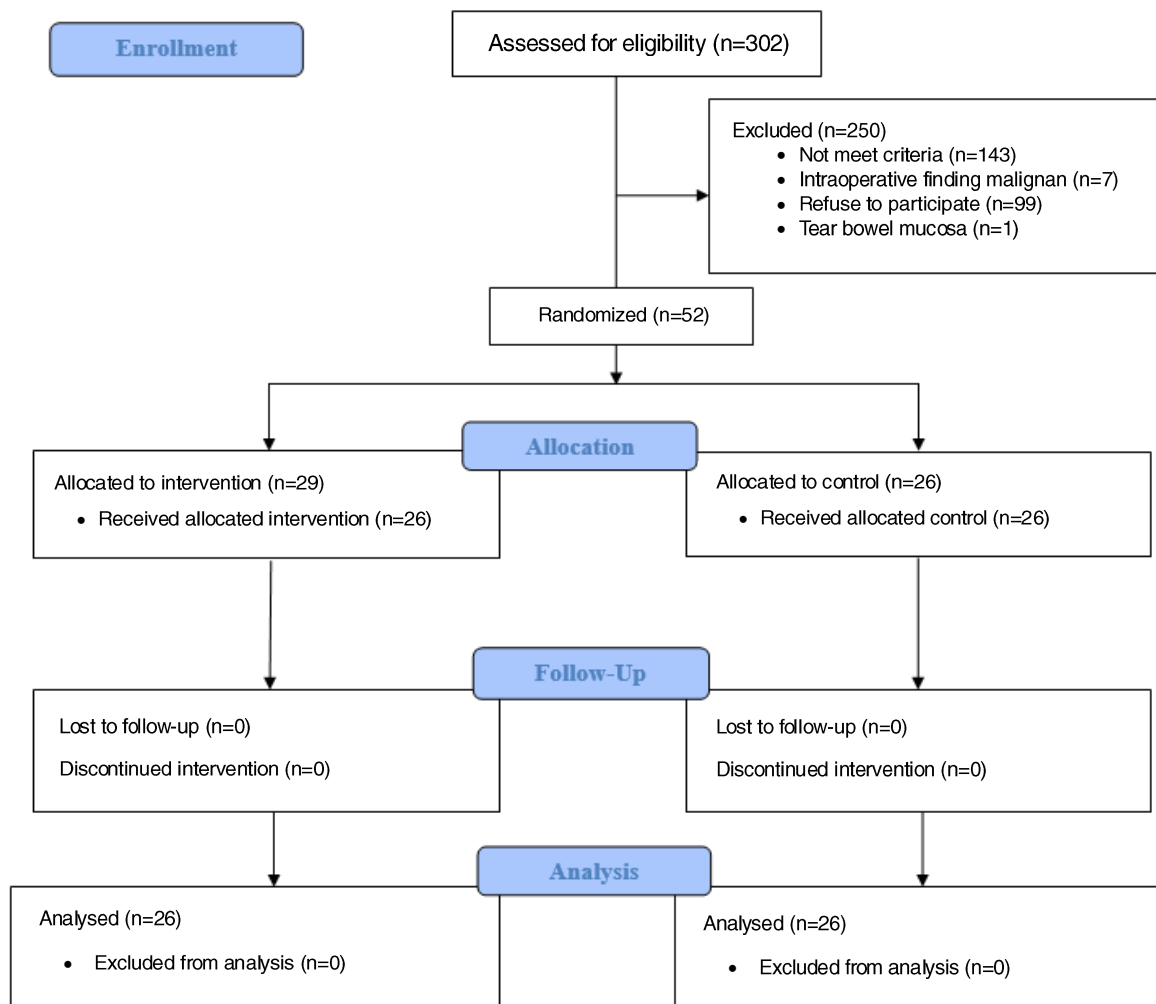


Fig. 1. CONSORT flow diagram.

Baseline characteristics, including age, body weight, body mass index (BMI), operative time, intraoperative morphine use, type of surgery, incision length, suture material, type of incision, and length of stay, were comparable between the two groups (Table 1).

The primary outcome, postoperative pain score at 12 hours, was significantly lower in the intervention group (bupivacaine with

dexamethasone) compared to the control group (bupivacaine with normal saline solution (NSS)), with a score of 4.3 ± 1.0 vs 5.9 ± 1.3 (mean difference -1.6, $p = 0.009$, 95%CI (0.33, 2.23))

For the secondary outcomes, postoperative pain scores at 2, 6, 18, and 24 hours showed no statistically significant differences between groups. Mean pain scores and effect sizes are shown in Table 2.

Table 1. Demographic data.

Demographic data	Bupivacaine + dexamethasone	Bupivacaine + NSS	p value
Woman age (years)	46.3 ± 6.8	49.3 ± 6.9	0.125 ^a
Body weight (kg)	62.1 ± 7.5	61.4 ± 6.7	0.727 ^a
Body mass index (kg/m ²)	24.9 ± 2.3	24.8 ± 2.5	0.835 ^a
Operative time (min)	105.5 ± 24.4	94.1 ± 30.4	0.143 ^a
Total dose of morphine intraoperation (mg)	6 (5.2, 9)	7 (6, 10)	0.272 ^b
Type of surgery			0.703 ^c
- TAH	3 (11.5)	5 (19.2)	
- TAH with uni/bilateral adnexal surgery	23 (88.5)	21 (80.8)	
Length of the incision (cm)	11.8 ± 1.8	12.5 ± 1.9	0.175 ^a
Suture material			0.492 ^c
- Non absorbable	9 (34.6)	12 (46.2)	
- Absorbable	14 (53.8)	13 (50)	
- Metallic	3 (11.5)	1 (3.8)	
Type of incision			1.000 ^d
- low midline	12 (46.2)	11 (42.3)	
- Pfannenstiel	14 (53.8)	15 (57.7)	
Length of stay (hour)	72 (68.4, 74.9)	72.1 (70.9, 73.4)	0.498 ^b

Data are presented as mean ± SD, n (%) or median (interquartile range).

^a student's t-test, ^b Mann-Whitney U test, ^c Fisher's exact test, ^d Chi-square test, ^a p value < 0.05 was considered statistically significant.

TAH: total abdominal hysterectomy, SD: standard deviation, IQR: interquartile range, NSS: normal saline solution

Table 2. Longitudinal postoperative visual analogue scale (VAS) pain scores.

Time	Within-group comparison ^a		Between-group difference	
	Bupivacaine + dexamethasone ^b	Bupivacaine + NSS ^b	(95% CI of mean difference) ^{a, c}	p value ^d
2 h	7.4 ± 2.8	7.7 ± 1.9	0.3 (-0.58, 1.18)	0.506
6 h	5.9 ± 2.1	6.4 ± 1.7	0.5 (-0.74, 1.16)	0.669
12 h	4.3 ± 1.0	5.9 ± 1.4	1.6 (0.33, 2.23)	0.009
18 h	3.9 ± 0.8	4.7 ± 1.3	0.8 (-0.43, 1.47)	0.282
24 h	3.5 ± 1.1	3.9 ± 1.1	0.4 (-0.78, 1.12)	0.721

^a Within-group and between-group comparisons were analyzed using a linear mixed-effects model.

^b for within-group analysis of VAS, both groups demonstrated significant differences across the five time points (p < 0.001). Data are presented as mean ± standard deviation.

^c Data are presented as mean difference with 95% confidence intervals (CI).

^d Reported p values represent between-group comparisons.

NSS: normal saline solution

Both groups experienced significant within-group reductions in pain scores compared to the 2-hour postoperative baseline ($p < 0.001$). In the intervention group, mean scores decreased by -1.5 at 6 hours, -3.1 at 12 hours, -3.5 at 18 hours, and -3.9 at 24 hours. In the control group, reductions were -1.3 at 6 hours, -1.8 at 12 hours, -3.0 at 18 hours, and -3.8 at 24 hours (Table 2). Between-group differences were only significant at 12 hours. The total postoperative morphine consumption was

not significantly different between the groups (12.7 ± 3.2 mg vs 13.6 ± 3.1 mg, $p = 0.313$) (Table 3). The incidence of PONV was also comparable (30.8% vs 42.3% , $p = 0.565$) (Table 3).

Patient satisfaction scores were high in both groups and did not differ significantly (9.2 vs 8.9 , $p = 0.157$). Wound complications rates in the intervention group were low (3.8% infection and 3.8% separation) and not statistically significant compared with controls ($p = 0.490$) (Table 3).

Table 3. Secondary outcomes, patient satisfaction, and safety outcomes.

Secondary outcomes	Bupivacaine + dexamethasone	Bupivacaine + NSS	p value
Morphine consumption (mg)	12.7 ± 3.2	13.6 ± 3.1	0.313^a
Postoperative nausea and vomiting	8 (30.8)	11 (42.3)	0.565^d
Patient satisfaction score	9.2 ± 0.7	8.9 ± 0.7	0.157^a
Surgical wound complications, n (%)			
Hematoma	0 (0)	0 (0)	0.490^c
Infection	1 (3.8)	0 (0)	
Separation	1 (3.8)	0 (0)	

Data are presented as mean $\pm$ SD or n (%).

^a student's t-test, ^c Fisher's exact test, ^d Chi-square test, ^a p value < 0.05 was considered statistically significant.

SD: standard deviation, NSS: normal saline solution

NSS: normal saline solution

Discussion

This randomized controlled trial evaluated the effect of adding 8 mg of subcutaneous dexamethasone to bupivacaine for local infiltration in women undergoing TAH with or without adnexal surgery for benign gynecologic conditions. The main finding was that the bupivacaine and dexamethasone group reported significantly lower pain scores at 12 hours postoperatively compared with the bupivacaine-only group.

Our findings are consistent with previous studies evaluating local infiltration with bupivacaine and dexamethasone. Jabalameli et al⁽²²⁾ reported that adding 16 mg of dexamethasone to bupivacaine during cesarean section significantly reduced postoperative pain scores at 12 hours compared with bupivacaine alone. Similarly, Méndez et al⁽²³⁾

demonstrated that subcutaneous infiltration with ropivacaine plus 8 mg of dexamethasone offered superior pain relief compared with ropivacaine alone, with notably lower pain scores at rest and during movement at both 12 and 24 hours after laparoscopic cholecystectomy.

These results agree with the findings of a systematic review and meta-analysis by Marchand et al⁽¹⁴⁾, which included 15 trials of intraoperative bupivacaine in gynecologic surgery. The review found that bupivacaine significantly improved postoperative pain scores, especially within the first 24 hours. Collectively, the evidence supports dexamethasone as an effective adjunct that extends the analgesic effects of local anesthetics.

Conversely, Ayatollahi et al⁽²⁹⁾ reported that adding 4 mg of dexamethasone to bupivacaine for

local infiltration after cesarean section did not significantly reduce postoperative pain scores during the first 24 hours compared with bupivacaine administered alone. This evidence suggested that variations in the dexamethasone dose might account for the differing pain scores observed. An 8 mg dose of dexamethasone is the lowest dose, and is more likely to prolong the analgesic duration of local anesthetics.

In our study, combining bupivacaine and dexamethasone was associated with a significant pain reduction at 12 hours postoperatively, compared with bupivacaine alone. No significant differences in postoperative pain scores were observed between the groups at 2, 6, 18, and 24 hours. However, within-group analysis revealed that both the intervention and control groups experienced a significant reduction in pain scores, as measured by VAS, compared to their 2-hour postoperative baseline.

Several factors may account for these findings. First, the similar pain scores between groups at earlier time points probably reflect the limited duration of action of bupivacaine, which normally lasts 2–8 hours⁽¹³⁾. To ensure correct dosing within the recommended therapeutic range of 2 mg/kg, obese patients were excluded from this study. The mean body weights of participants in the intervention (62.1 kg) and control (62.4 kg) groups did not differ significantly, indicating the administered dose per kilogram was comparable. Thus, the similar VAS scores at 2 and 6 hours can be attributed primarily to the bupivacaine analgesic effect.

The significantly lower pain scores observed at 12 hours in the intervention group suggest a synergistic effect between dexamethasone and bupivacaine, potentially extending analgesic duration from approximately 6 to 12 hours, as previously reported^(10,18,19). This effect may be partly explained by systemic absorption of dexamethasone following subcutaneous infiltration, as peak plasma concentrations occur within 1–2 hours and may contribute to late-phase anti-inflammatory analgesia^(18,19). The absence of between-group

differences at 18 and 24 hours is attributable to waning drug effects and the use of systemic oral analgesics in both groups.

When evaluating the clinical relevance of the observed pain reduction at 12 hours, consideration of the minimal clinically important difference (MCID) is essential. In a prospective study of elective surgical patients in Thailand, Charoenpol et al (30) reported an MCID of 12 mm for acute postoperative pain measured with the VAS. In this study, the difference in pain scores between groups at 12 hours was 1.6 VAS units (equivalent to 16 mm), exceeding the established MCID threshold and suggesting a significant reduction in pain intensity with the addition of dexamethasone.

Although pain scores decreased, total postoperative morphine consumption did not significantly differ between the groups (12.7 ± 3.2 mg vs 13.6 ± 3.1 mg, $p = 0.313$). This apparent discrepancy may be due to the postoperative analgesic protocol, where additional morphine was administered only as-needed when the VAS score was ≥ 5 and upon patient request after the first 12-hour postoperative period. Consequently, some patients with higher pain scores may not have requested additional opioid analgesia because of individual pain tolerance, concerns regarding opioid-related adverse effects, or satisfactory relief from scheduled baseline analgesia. Under such a pro re nata-based analgesic regimen, postoperative morphine consumption may not fully indicate differences in pain intensity⁽³¹⁾. Therefore, while dexamethasone was associated with a statistically and meaningfully lower pain score at 12 hours, the absence of an effect on opioid use indicates that its overall clinical utility as an adjunct to bupivacaine for wound infiltration may be limited.

This finding contrasts with Sukjariangporn et al⁽²⁾, who reported that pre-emptive gabapentin significantly reduced mean postoperative total opioid consumption through patient-controlled analgesia (PCA). However, the lack of specific data regarding intraoperative opioid doses in their study makes absolute comparisons challenging. Additionally, our

institutional pain protocol, which mandated fixed-interval morphine administration every 4 hours for the first 12 hours, likely influenced overall consumption and may mask potential differences between the groups. Similarly, patient satisfaction scores were comparable between the two groups (9.2 vs 8.9, $p = 0.157$), likely reflecting the overall effectiveness of the multimodal analgesic approach used at our institution. The incidence of PONV was 30.8% in participants receiving 8 mg of dexamethasone as an add-on to bupivacaine, compared with 42.3% in those receiving bupivacaine alone, with no statistically significant difference. This finding aligns with Suhongsa et al⁽³²⁾, who reported similar PONV rates within 24 hours between dexamethasone and saline groups (32.6% vs 48.8%, relative risk 0.67 [95% CI 0.39, 1.13], $p = 0.09$) among 86 participants undergoing TAH with or without adnexal surgery.

Adverse effects, including wound infections and separation, occurred in 3.8% of the intervention group; there were no significant differences between groups. Similarly, the length of hospital stay was comparable (72.0 vs 72.1 hours, $p = 0.498$), consistent with a systematic review by Poldeman et al⁽²⁰⁾, which concluded that a single dose of dexamethasone did not increase the risk of infection or prolong hospitalization.

Strengths and limitations

This study has several strengths. Its double-blind randomized controlled design minimized bias, and conducting the study at a single center ensured consistent protocols for perioperative analgesia, general anesthesia, surgical techniques, and infiltration procedures. Additionally, using a linear mixed-effects model strengthened the analysis of pain scores over time, both within and between groups, amplifying the validity of the results.

However, several limitations should be recognized. First, although adding dexamethasone was associated with a statistically significant reduction in mean pain scores at 12 hours postoperatively, —

consistent with its known effect of prolonging bupivacaine's analgesic duration, —it did not reduce postoperative morphine consumption or improve patient satisfaction. This emphasizes the distinction between statistical and clinical significance, as a transient reduction in pain intensity at a single time point may not necessarily translate into a meaningful change in overall analgesic requirements. Several factors may explain this discrepancy. The dose of dexamethasone administered per wound area in the present study was lower than that used in previous studies, such as Jabalameli et al⁽²²⁾, which may have limited its opioid-sparing effect. Additionally, our institutional pain management protocol includes scheduled morphine administration every 4 hours during the early postoperative period, which may have attenuated observable differences in opioid consumption between groups despite differing pain scores.

Second, the single-center design of this study could have limited the generalizability of the results. Because the trial was conducted at a single institution, the findings reflected the facility's specific surgical techniques, anesthetic practices, and postoperative nursing care protocols. Consequently, these results might not be fully representative of other healthcare settings with different clinical environments or patient populations. Third, the findings regarding dexamethasone cannot be applied to other corticosteroids due to differences in pharmacological properties, such as half-life, duration of action, and anti-inflammatory effects. Fourth, obese patients were excluded, which limits the applicability of the results to this subgroup. Finally, the sample size was determined based on the primary outcome and may not have been sufficient to detect rare adverse events or other postoperative complications. Future well-powered studies are required to establish the optimal dexamethasone dose, to confirm its safety and efficacy, including in obese patients, and assess the long-term outcomes, such as chronic postoperative pain after TAH with or without adnexal surgery for

benign gynecologic conditions.

Conclusion

The addition of 8 mg of dexamethasone to bupivacaine for wound infiltration was associated with a statistically significant reduction in postoperative pain at 12 hours following TAH for benign gynecologic conditions compared with bupivacaine alone. However, no clinically meaningful difference in postoperative morphine consumption was observed. No differences were found at other time points or in secondary outcomes. Larger studies are needed to confirm the duration of benefit and further evaluate safety.

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Potential conflicts of interest

The authors declare no conflicts of interest.

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