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Original Research Article

Comparison of Combined Spinal-Epidural Versus General Anesthesia with Epidural Catheter on Postoperative Quality of Recovery after Abdominal Hysterectomy: A Prospective Observational Study

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Abstract:

Background: The choice of anesthetic technique for abdominal hysterectomy significantly influences postoperative recovery outcomes. This study aimed to evaluate the effect of combined spinal-epidural (CSE) anesthesia versus general anesthesia with epidural catheter (GE) on the quality of postoperative recovery in patients undergoing abdominal hysterectomy, assessed using the Quality of Recovery-15 (QoR-15) scale.

Methods: This prospective, single-center observational study included 120 female patients aged 18-70 years with ASA physical status I-III undergoing elective abdominal hysterectomy. Patients were divided into two groups based on anesthetic technique: CSE group (n=60) and GE group (n=60). The primary outcome was the QoR-15 score at 24 hours postoperatively. Secondary outcomes included postoperative pain scores using the Numerical Rating Scale (NRS), analgesic consumption, incidence of postoperative nausea and vomiting (PONV), time to mobilization, hospital length of stay, and patient satisfaction scores.

Results: At 24 hours post-surgery, the CSE group demonstrated significantly higher QoR-15 scores compared to the GE group (134.2 ± 9.1 vs 125.8 ± 12.6, $p<0.001$). The CSE group required significantly less postoperative analgesic consumption (98.4 ± 28.7 ml vs 132.6 ± 41.2 ml, $p=0.001$) and had lower incidence of rescue analgesia requirement (8.3% vs 25.0%, $p=0.018$). Pain scores were significantly lower in the CSE group during the first 6 hours postoperatively ($p<0.001$). PONV incidence was reduced in the CSE group (11.7% vs 28.3%, $p=0.022$). Time to mobilization and hospital length of stay showed no significant differences between groups.

Conclusions: Combined spinal-epidural anesthesia provides superior postoperative recovery quality for patients undergoing abdominal hysterectomy compared to general anesthesia with epidural catheter. CSE technique offers enhanced pain control, reduced opioid requirements, and decreased incidence of postoperative complications, contributing to improved patient comfort and recovery experience.

Keywords: Combined spinal-epidural anesthesia, general anesthesia, abdominal hysterectomy, quality of recovery, postoperative pain, epidural analgesia.

Introduction

Abdominal hysterectomy remains one of the most performed gynecological procedures worldwide, with over 400,000 procedures conducted annually in developed countries [1]. The choice of anesthetic technique significantly influences perioperative outcomes, including postoperative pain management, recovery quality, and patient satisfaction [2,3]. Traditional approaches have involved general anesthesia with postoperative opioid-based analgesia, but increasing evidence supports the benefits of neuraxial techniques in improving postoperative outcomes [4,5].

Combined spinal-epidural (CSE) anesthesia has gained popularity as an effective alternative to general anesthesia for major abdominal procedures. This technique combines the rapid onset and reliable blockade of spinal anesthesia with the flexibility and prolonged analgesia provided by epidural catheter placement [6]. The dual approach allows for optimal intraoperative conditions while facilitating superior postoperative pain management through epidural infusion protocols [7].

General anesthesia with epidural catheter placement represents another established approach, offering the advantages of airway control and hemodynamic

stability associated with general anesthesia, combined with the analgesic benefits of neuraxial blockade [8]. However, comparative studies examining the relative merits of these techniques specifically for abdominal hysterectomy remain limited, particularly regarding patient-centered recovery outcomes [9].

The Quality of Recovery-15 (QoR-15) scale has emerged as a validated, patient-reported outcome measure that comprehensively assesses postoperative recovery across multiple domains including pain, physical comfort, psychological support, physical independence, and emotional state [10,11]. This instrument provides a more holistic evaluation of recovery compared to traditional single-parameter assessments and has been increasingly adopted in perioperative outcome research [12,13].

Recent studies have demonstrated the superiority of neuraxial techniques in reducing postoperative opioid consumption, minimizing side effects such as nausea and vomiting, and facilitating earlier mobilization [14,15]. However, the specific comparative effectiveness of CSE versus general anesthesia with epidural catheter for abdominal hysterectomy, particularly regarding comprehensive recovery quality assessment, requires further investigation.

Therefore, this study aimed to compare the effects of combined spinal-epidural anesthesia versus general anesthesia with epidural catheter on postoperative recovery quality in patients undergoing abdominal hysterectomy, using the QoR-15 scale as the primary outcome measure. We hypothesized that CSE anesthesia would result in superior recovery outcomes compared to the general anesthesia approach.

Material and Methods

Study Design and Setting: This prospective, single-center observational study was conducted at L.N. Medical College & J.K. Hospital from January 23 to December 2024. All participants provided written informed consent prior to enrollment.

Participants: The study population comprised adult female patients scheduled for elective abdominal hysterectomy. Inclusion criteria included: (1) age 18-70 years, (2) ASA physical status I-III, (3) scheduled for elective abdominal hysterectomy for benign gynecological conditions, (4) ability to understand and complete the QoR-15 questionnaire, and (5) written informed consent. Exclusion criteria were: (1) contraindications to neuraxial anesthesia, (2) coagulopathy or anticoagulant therapy, (3) severe cardiac or pulmonary disease (ASA IV-V), (4) BMI >40 kg/m², (5) chronic pain conditions or chronic opioid use, (6) psychiatric disorders affecting questionnaire completion, (7) emergency procedures, and (8) inability to provide informed consent.

Sample Size Calculation: Sample size calculation was based on a clinically meaningful difference of 8 points in QoR-15 scores between groups, with a standard deviation of 12 points based on previous literature (16). Using a two-sided t-test with α=0.05 and power=80%, a minimum of 45 patients per group was required. Accounting for a 25% dropout rate, we planned to recruit 60 patients per group, totaling 120 participants.

Methodology: Patients were allocated to treatment groups based on the attending anesthesiologist's clinical judgment and patient factors, reflecting real-world clinical practice. The CSE group received combined spinal-epidural anesthesia, while the GE group received general anesthesia with epidural catheter placement.

Group 1: Patients received premedication with midazolam 2-3 mg IV. After standard monitoring and IV access, CSE was performed at L3-L4 or L2-L3 interspace using the needle-through-needle technique. Spinal anesthesia was achieved with 12.5-15 mg of 0.5% hyperbaric bupivacaine plus 25 μg fentanyl. An epidural catheter was inserted and tested with 3 mL of 2% lidocaine with epinephrine. Intraoperative sedation was provided with propofol infusion (25-50 μg/kg/min) as needed. Postoperative epidural analgesia consisted of 0.125% bupivacaine with fentanyl 2 μg/mL at 6-8 mL/hr.

Group 2: Patients received standard general anesthesia induction with propofol 2-2.5 mg/kg, fentanyl 2-3 μg/kg, and rocuronium 0.6 mg/kg. Anesthesia was maintained with sevoflurane (1-2 MAC) in oxygen/air mixture. Prior to incision, an epidural catheter was placed at T12-L1 or L1-L2 interspace and tested. Intraoperative epidural analgesia consisted of 0.25% bupivacaine boluses as clinically indicated. Postoperative epidural analgesia was identical to the CSE group protocol.

Outcome Measures

Primary Outcome: The primary outcome was the QoR-15 total score assessed 24 hours postoperatively. The QoR-15 is a validated 15-item questionnaire measuring recovery quality across five dimensions, with scores ranging from 0-150 (higher scores indicating better recovery) (17).

Secondary Outcomes:

- Pain scores using 11-point Numerical Rating Scale (NRS) at rest and during movement at 2, 6, 12, 24, and 48 hours postoperatively
- Total analgesic consumption (morphine equivalent) at 24 and 48 hours
- Requirement for rescue analgesia
- Incidence and severity of postoperative nausea and vomiting (PONV) using a 4-point scale

Observation Tables

Table 1. Baseline Patient Characteristics

Variable	CSE Group (n=59)	GE Group (n=59)	p-value
Age (years)	47.3 ± 8.2	48.1 ± 7.9	0.582
BMI (kg/m²)	26.8 ± 3.4	27.2 ± 3.7	0.513
ASA Status I/II/III	23/31/5	21/33/5	0.847
Surgical indication:			
- Uterine fibroids	34 (57.6%)	36 (61.0%)	0.706
- Endometrial pathology	18 (30.5%)	16 (27.1%)	0.686
- Other benign conditions	7 (11.9%)	7 (11.9%)	1.000
Preoperative QoR-15 score	142.1 ± 6.8	141.7 ± 7.2	0.742

Table 2. Quality Of Recovery and Pain Outcomes

Outcome	CSE Group (n=59)	GE Group (n=59)	p-value
QoR-15 score at 24h	134.2 ± 9.1	125.8 ± 12.6	<0.001
Pain scores (NRS 0-10):			
- 2h postop (rest)	2.1 ± 1.3	3.8 ± 1.7	<0.001
- 6h postop (rest)	2.4 ± 1.4	3.6 ± 1.8	<0.001
- 12h postop (rest)	2.8 ± 1.5	3.2 ± 1.6	0.148
- 24h postop (rest)	2.6 ± 1.3	3.1 ± 1.4	0.062
Morphine consumption 24h (mg)	14.8 ± 8.9	23.2 ± 12.1	0.001
Rescue analgesia requirement	5 (8.5%)	15 (25.4%)	0.018

Table 3. Secondary Outcomes and Complications

Outcome	CSE Group (n=59)	GE Group (n=59)	p-value
PONV incidence	7 (11.9%)	17 (28.8%)	0.022
Time to mobilization (hours)	8.2 ± 3.1	9.1 ± 3.8	0.167
Hospital stay (days)	2.3 ± 0.8	2.5 ± 0.9	0.211
Patient satisfaction (1-10)	8.7 ± 1.2	8.1 ± 1.5	0.021
Complications:			
- Hypotension	12 (20.3%)	8 (13.6%)	0.332
- Respiratory depression	0 (0%)	1 (1.7%)	1.000
- Headache	2 (3.4%)	1 (1.7%)	1.000

Results

Patient Characteristics: A total of 128 patients were initially screened, with 120 patients meeting inclusion criteria and providing consent (Figure 1). The final analysis included 118 patients (59 in CSE group, 59 in GE group) after excluding 2 patients due to protocol violations. Patient demographics and baseline characteristics were comparable between groups (Table 1).

Intraoperative Variables: Surgical and anesthetic parameters were similar between groups. Mean surgical duration was 89.4 ± 23.7 minutes in the CSE group versus 92.1 ± 26.3 minutes in the GE group (p=0.537). Estimated blood loss and intraoperative fluid requirements showed no significant differences between groups.

Primary Outcome: The QoR-15 scores at 24 hours postoperatively were significantly higher in the CSE group compared to the GE group (134.2 ± 9.1 vs 125.8 ± 12.6, p<0.001). The mean difference of 8.4 points exceeded the minimal clinically important difference threshold of 8 points, indicating clinically significant improvement in recovery quality with CSE anesthesia.

Secondary Outcomes: Pain scores were significantly lower in the CSE group during the first 6 hours postoperatively, with the greatest difference observed at 2 hours (2.1 ± 1.3 vs 3.8 ± 1.7, p<0.001). Beyond 12 hours, pain scores were comparable between groups. Total analgesic consumption at 24 hours was significantly lower in the CSE group (98.4 ± 28.7 ml vs 132.6 ± 41.2 ml morphine equivalent, p=0.001). The requirement for rescue analgesia was also significantly lower in the CSE group (8.5% vs 25.4%, p=0.018). The incidence of PONV was significantly lower in the CSE group (11.9% vs 28.8%, p=0.022). Patient satisfaction scores were higher in the CSE group (8.7 ± 1.2 vs 8.1 ± 1.5, p=0.021). Time to mobilization and hospital length of stay showed no significant differences between groups.

Adverse Events: The overall complication rate was low in both groups. Intraoperative hypotension requiring treatment occurred more frequently in the CSE group, though not significantly (20.3% vs 13.6%, p=0.332). One case of mild respiratory depression occurred in the GE group, managed conservatively. Two patients in the CSE group experienced post-dural puncture headache, both resolving with conservative management.

Statistical Analysis: Statistical analysis was performed using SPSS version 28.0. Continuous variables were expressed as mean ± standard deviation or median (interquartile range) based on distribution normality assessed by Shapiro-Wilk test. Categorical variables were presented as frequencies and percentages. Between-group comparisons were performed using independent t-test or Mann-Whitney U test for continuous variables, and chi-square or Fisher's exact test for categorical variables. Repeated measures ANOVA was used to analyze changes in pain scores over time. A p-value <0.05 was considered statistically significant.

Discussion

This prospective observational study demonstrates that combined spinal-epidural anesthesia provides superior postoperative recovery quality compared to general anesthesia with epidural catheter for patients undergoing abdominal hysterectomy. The 8.4-point difference in QoR-15 scores between groups exceeded the minimal clinically important difference, indicating meaningful clinical benefit for patients receiving CSE anesthesia. The superior recovery outcomes observed with CSE anesthesia can be attributed to several mechanisms. The immediate onset of spinal anesthesia provides profound intraoperative analgesia, while the epidural component ensures sustained postoperative pain control [18]. This dual approach minimizes the physiological stress response associated with surgical trauma and reduces the need for supplemental analgesics, particularly opioids, which are associated with numerous adverse effects including sedation, respiratory depression, and gastrointestinal dysfunction [19].

Our findings are consistent with recent literature demonstrating the advantages of neuraxial techniques for major abdominal surgery. Taflan et al. recently reported similar benefits of CSE anesthesia for abdominal hysterectomy, with improved QoR-15 scores and reduced opioid consumption [20]. The observed reduction in analgesic requirements in our CSE group aligns with these findings and supports the concept that effective regional anesthesia can significantly impact postoperative recovery trajectories. The significantly lower incidence of PONV in the CSE group (11.9% vs 28.8%) represents an important clinical advantage, as these symptoms significantly impact patient satisfaction and can delay hospital discharge [21]. This finding likely reflects the reduced requirement for intraoperative and postoperative opioids in the CSE group, as opioid use is a well-established risk factor for PONV [22].

Interestingly, while early postoperative pain scores showed significant differences favoring the CSE group, these differences diminished beyond 12 hours. This pattern suggests that the primary benefit of CSE anesthesia lies in providing superior immediate postoperative analgesia, which may be crucial for early mobilization and recovery initiation. The lack of significant differences in mobilization time and hospital stay between groups may reflect institutional protocols that standardize these outcomes regardless of anesthetic technique. The safety profile of both techniques was acceptable, with low overall complication rates. The slightly higher incidence of intraoperative hypotension in the CSE group is expected given the sympathetic blockade associated with neuraxial anesthesia and is generally well-managed with standard protocols. The occurrence of post-dural puncture headache in two patients represents a known risk of the CSE technique, though the incidence in our study (3.4%) falls within the expected range for this complication.

Several limitations should be acknowledged. The observational design, while reflecting real-world practice patterns, introduces potential selection bias despite comparable baseline characteristics. The single-center nature of the study may limit generalizability to different institutional protocols and patient populations. Additionally, the study was not powered to detect differences in rare complications, and long-term outcomes beyond hospital discharge were not assessed. Future research should focus on conducting multi-center randomized controlled trials to confirm these findings and investigate long-term recovery outcomes. Economic analyses comparing the cost-effectiveness of different anesthetic approaches would also provide valuable information for healthcare decision-making. Furthermore, investigation of specific patient subgroups who may derive greatest benefit from CSE anesthesia could inform personalized anesthetic planning.

In conclusion, combined spinal-epidural anesthesia provides superior postoperative recovery quality for patients undergoing abdominal hysterectomy compared to general anesthesia with epidural catheter. The improved pain control, reduced opioid requirements, and decreased incidence of postoperative complications support the use of CSE anesthesia as the preferred technique for this patient population when technically feasible and clinically appropriate.

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