Journal of Clinical and Nursing Research, 2026, Volume 10, Issue 7
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

# Application of Esketamine in Laparoscopic Gynecological Malignancy Surgery

**Jie Ren, Xue Cao, Yuhua Ma, Lijing Zhong**

Xing'an League People's Hospital, Xing'an League 137400, Inner Mongolia Autonomous Region, China



**Abstract:** This article systematically analyzes the impact of esketamine on postoperative pain levels, cognitive function, and adverse reactions in patients undergoing laparoscopic gynecological malignancy surgery. A prospective, double-blind, randomized controlled study was conducted, selecting 22 patients from our hospital who underwent laparoscopic gynecological malignancy surgery. They were randomly divided into an experimental group (Group K) and a control group (Group C) using a random number table method, with 11 patients in each group. Group K received a single intravenous infusion of 0.5 mg/kg esketamine before skin incision and a continuous infusion of normal saline during surgery; Group C received an equivalent amount of normal saline before skin incision and did not use any NMDA receptor antagonists throughout the procedure. Within 48 hours postoperatively, the numerical rating scale (NRS) scores for pain in Group K were lower than those in Group C ($p < 0.05$); there was no significant difference in preoperative Mini-Mental State Examination (MMSE) scores between the two groups ($p > 0.05$), but the postoperative decrease in MMSE scores was smaller in Group K than in Group C; the incidence of adverse reactions in Group K was 9.09% (1/11), which was lower than the 54.55% (6/11) in Group C. The use of esketamine in laparoscopic gynecological malignancy surgery can alleviate postoperative pain, reduce cognitive impairment, and lower the incidence of adverse reactions, making it suitable for clinical promotion.

**Keywords:** Esketamine; Laparoscopy; Gynecological malignancy surgery

**Online publication:** Jul 31, 2026

## 1. Introduction

Laparoscopic radical surgery for gynecological malignancies is currently one of the key surgical approaches for treating gynecological malignancies in clinical practice. Its main advantages lie in minimal trauma and rapid postoperative recovery, which have led to its widespread application and patient acceptance in clinical settings [1]. However, pain management during the perioperative period and improvement of postoperative cognitive function are critical challenges that need to be addressed in the field of clinical anesthesia. Postoperative pain often causes physical discomfort in patients, interferes with their psychological state, and delays the rehabilitation process. Meanwhile, postoperative cognitive dysfunction in patients can significantly

reduce their quality of life, prolong hospital stays, and further increase the burden on families and society [2]. Currently, esketamine, as a novel anesthetic analgesic, possesses unique pharmacological effects that provide efficient analgesia for patients and may have a positive impact on their cognitive function. However, there are relatively few specialized studies on the application effects of this drug in laparoscopic gynecological malignancy surgery [3]. This article designs a rigorous controlled trial to explore its application value in such surgeries, aiming to optimize clinical anesthesia protocols and improve patients' postoperative rehabilitation quality.

## 2. Materials and methods

### 2.1. General information

The research protocol of this article has been reviewed and approved by the Medical Ethics Committee of our hospital. All participating patients signed informed consent forms after fully understanding the research content and potential risks. The study subjects were patients who underwent laparoscopic gynecological malignancy surgery in our hospital from January 2024 to December 2025. The inclusion criteria were as follows: aged 18 years or older, scheduled to undergo elective laparoscopic radical surgery for gynecological malignancies under general anesthesia, classified as American Society of Anesthesiologists (ASA) grade III, with an expected survival period of more than 3 months based on clinical assessment, and voluntarily signed the research informed consent form. The exclusion criteria included patients expected to be transferred to the ICU for monitoring after surgery, patients with a history of allergy to esketamine injection, patients with concurrent psychiatric disorders, severe consciousness impairment, or preoperative cognitive dysfunction, patients with a serious cardiovascular history (such as congestive heart failure, severe angina attacks, unstable angina or myocardial infarction within the past 6 months), pregnant or lactating women, patients with a preoperative MMSE score ≤ 18, patients with contraindications to esketamine use (such as patients at risk of severe hypertension or increased intracranial pressure, patients with glaucoma with high intraocular pressure or concurrent penetrating eye injuries, uncontrolled hypertension (resting systolic blood pressure > 180 mmHg or diastolic blood pressure > 100 mmHg), hyperthyroidism, preeclampsia or eclampsia, or situations requiring the use of uterine relaxants). Ultimately, a total of 22 eligible patients were included and randomly divided into two groups using a random number table method. There were no significant differences in general clinical data between the two groups ($p > 0.05$), indicating comparability. Specific data are detailed in **Table 1**.

**Table 1.** Baseline data of the two groups

| Item | Experimental group (Group K, n=11) | Control group (Group C, n = 11) | $\chi^2/t$ value | $p$ value |
|---|---|---|---|---|
| Age (years, $\overline{x} \pm s$) | 45.22 ± 8.51 | 44.86 ± 9.10 | 0.095 | 0.924 |
| Height (cm, $\overline{x} \pm s$) | 160.31 ± 5.20 | 159.37 ± 4.97 | 0.433 | 0.669 |
| Weight (kg, $\overline{x} \pm s$) | 58.65 ± 7.31 | 59.13 ± 7.38 | 0.153 | 0.879 |
| BMI (kg/m², $\overline{x} \pm s$) | 22.85 ± 2.14 | 22.95 ± 2.08 | 0.111 | 0.912 |

### 2.2. Methods

#### 2.2.1. Pre-anesthesia preparation

On the day before surgery, medical staff will conduct a risk assessment related to anesthesia for the patient,

primarily by collecting their medical history, performing a physical examination, and identifying any contraindications to medication. They will also explain the anesthesia plan and potential risks to the patient and their family, obtaining their understanding and cooperation before signing an informed consent form. The patient's preoperative cognitive function will be assessed using the MMSE scale, with the scoring criteria being: a score of 27–30 indicates normal cognitive function, while a score below 27 suggests possible cognitive dysfunction.

### 2.2.2. Anesthesia induction and maintenance

Upon entering the operating room, all patients will have an intravenous access established, and routine monitoring of blood pressure (BP), heart rate (HR), and oxygen saturation ($SPO_2$) will be initiated simultaneously. The general anesthesia induction process is as follows: 10 minutes before induction, dexmedetomidine will be administered at a dose of 1 μg/kg via infusion pump, followed by sequential intravenous injections of 2 mg/kg propofol, 0.3 μg/kg sufentanil, and 0.15 mg/kg cisatracurium. General anesthesia will be maintained through continuous infusion, with propofol at a dose of 4–8 mg/kg/h, dexmedetomidine at 0.5 μg/kg/h, and remifentanil at 0.1–0.2 μg/kg/min, while cisatracurium at 0.15 mg/kg will be administered intermittently intravenously to maintain muscle relaxation. Before the end of surgery, patients will receive an intravenous injection of 10 μg sufentanil and 30 mg ketorolac tromethamine for analgesic bridging. Group medication administration: Group K will receive a single intravenous infusion of 0.5 mg/kg esketamine before skin incision, with continuous saline infusion during surgery; Group C will receive an equivalent dose of saline before skin incision, without the use of any NMDA receptor antagonists such as dextromethorphan or amantadine throughout the procedure.

### 2.2.3. Postoperative analgesia plan

Both groups of patients will use a patient-controlled intravenous analgesia (PCIA) plan after surgery, with a drug concentration of 2 μg/ml sufentanil. The relevant parameters are set as follows: a loading dose of 1–3 μg, a single bolus dose of 3 μg, a lockout time of 10 minutes, and a continuous infusion rate of 2 μg/h. This plan is formulated based on the "Expert Consensus on Postoperative Pain Management in Adults (2017 Edition)" by the Anesthesiology Branch of the Chinese Medical Association.

### 2.2.4. Pain rescue measures

After surgery, follow-up will be conducted, and the patient's pain level will be assessed using the NRS scale. If the patient's NRS score reaches 4 or above, rescue treatment with other analgesic drugs will be administered until the score drops to 3 or below, while recording the number of rescue analgesic administrations and the drug dosage used.

## 2.3. Observation indicators

(1) Postoperative pain assessment

Record the NRS scores within 48 hours after surgery. The scale divides pain intensity into 0–10 points, with 0 indicating no pain, 1–3 indicating mild pain, 4–6 indicating moderate pain, 7–9 indicating severe pain, and 10 indicating excruciating pain. A higher score indicates a more severe level of pain.

(2) Cognitive function assessment

The MMSE scale will be used to assess the patient's cognitive function before and after surgery,

comparing the preoperative score differences and the postoperative score reduction between the two groups.

(3) Adverse reaction monitoring

Record the occurrence of hypotension, hypertension, bradycardia, tachycardia, decreased oxygen saturation, coughing, laryngospasm, and body movement during the perioperative period.

### 2.4. Statistical analysis

For data processing in this study, professional SPSS 26.0 software will be selected. Count data will be presented in the format of [n (%)], and the $\chi^2$ test will be used for comparison between groups. Measurement data will be processed using ($\overline{x} \pm s$), and independent sample *t*-tests will be used for comparison between groups to determine whether the mean differences between two independent samples meet statistical standards. This study sets clear criteria: when $p < 0.05$, it indicates a difference between different groups.

## 3. Results

### 3.1. Postoperative NRS pain scores of patients

The scores of Group K were lower than those of Group C at all postoperative time points ($p < 0.05$), as shown in **Table 1**.

**Table 1.** Comparison of NRS scores between the two groups ($\overline{x} \pm s$, points)

| Group | Number of cases | 2h postoperatively | 4h postoperatively | 24h postoperatively | 48h postoperatively |
|---|---|---|---|---|---|
| K group | 11 | 3.19 ± 1.02 | 2.57 ± 0.86 | 1.86 ± 0.64 | 1.20 ± 0.42 |
| C group | 11 | 4.61 ± 1.22 | 3.88 ± 1.13 | 2.98 ± 0.95 | 2.14 ± 0.75 |
| *t* | / | 2.961 | 3.059 | 3.242 | 3.626 |
| *p* | / | 0.008 | 0.006 | 0.004 | 0.002 |

### 3.2. Preoperative and postoperative MMSE scores of patients

The decrease in MMSE scores in Group K after surgery was slighter than that in Group C ($p< 0.05$), as shown in **Table 2**.

**Table 2.** Comparison of MMSE Scores Between the Two Groups ($\overline{x} \pm s$, points)

| Group | Number of cases | Preoperative | Postoperative |
|---|---|---|---|
| K group | 11 | 28.50 ± 1.24 | 27.99 ± 1.02 |
| C group | 11 | 28.35 ± 1.13 | 26.58 ± 1.35 |
| *t* | / | 0.296 | 2.763 |
| *P* | / | 0.770 | 0.012 |

### 3.3. Incidence of Adverse Reactions

The incidence rates in the two groups were 9.09% and 54.55%, respectively, with Group K showing a lower rate ($p < 0.05$), as shown in **Table 3**.

**Table 3.** Comparison of adverse reactions between the two groups (n, %)

| Group | Number of cases | Hypotension | Hypertension | Bradycardia | Tachycardia | Oxygen desaturation | Coughing | Laryngospasm | Body movement | Total incidence rate (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| K group | 11 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.09 |
| C group | 11 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 54.55 |
| $\chi^2$ | / | / | / | / | / | / | / | / | / | 5.238 |
| *p* | / | / | / | / | / | / | / | / | / | 0.022 |

## 4. Discussion

This study employed a prospective, double-blind, randomized controlled trial to systematically investigate the clinical performance of esketamine in laparoscopic gynecological malignancy surgery, providing reliable evidence-based grounds for optimizing anesthesia protocols for such procedures. The NRS scores at all time points within 48 hours postoperatively were lower in Group K than in Group C, indicating that esketamine effectively alleviates postoperative pain. This analgesic effect may stem from esketamine's specific blockade of NMDA receptors, which are key targets mediating central transmission and sensitization of pain signals. Blocking these receptors inhibits the process of central nervous system pain sensitization. Additionally, esketamine may enhance analgesic effects through multiple pathways, such as modulating the endogenous opioid system [4]. Effective postoperative analgesia can reduce physical suffering in patients, mitigate stress responses triggered by pain, and promote postoperative recovery. Regarding cognitive function protection, there was no difference in preoperative MMSE scores between the two groups, indicating that baseline cognitive function was at the same level. Postoperatively, the decline in MMSE scores was smaller in Group K, suggesting that esketamine has a certain protective effect on patients' postoperative cognitive function. Surgical trauma, exposure to anesthetic drugs, and stress responses during the perioperative period can all lead to cognitive impairment in patients. Esketamine can regulate neurotransmitter release, reduce central inflammatory responses, decrease the extent of brain damage caused by surgery and anesthesia, and maintain stable cognitive function. The practical value of this study lies in improving patients' postoperative quality of life and reducing adverse events related to cognitive dysfunction [5]. When comparing the safety profiles of the two groups, the incidence of adverse reactions was lower in Group K than in Group C, indicating that esketamine has good safety in clinical applications. This low incidence of adverse reactions is related to its unique pharmacological properties. Esketamine can achieve anesthesia and analgesia while having a relatively mild impact on the cardiovascular and respiratory systems, reducing the risk of related adverse reactions.

## 5. Conclusion

The use of esketamine in patients undergoing laparoscopic gynecological malignancy surgery can significantly reduce postoperative pain, protect cognitive function, minimize the occurrence of adverse reactions, and enhance patients' surgical experience and recovery quality, making it suitable for clinical promotion. However, this study also has various limitations, such as a small sample size, which may limit the generalizability of the results, and a short observation period, which prevents the determination of the long-term effects of the drug. Therefore, subsequent studies could appropriately expand the sample size and

conduct multicenter research to analyze the actual effects of different doses of this drug and its synergistic effects with other drugs, effectively optimizing clinical anesthesia protocols and enhancing the quality and safety of anesthesia. As relevant research progresses, esketamine can play an even more satisfactory role in the anesthesia management of laparoscopic gynecological malignancy surgery.

## Ethics Review Number

Ethics Committee of Xing'an League People's Hospital (XYLS2025-40).


## Funding

Scientific Research Joint Fund for Public Hospitals of the Inner Mongolia Medical Academy of Sciences (Project No.: 2023GLLH0455)


## Disclosure statement

The authors declare no conflict of interest.

## References


[1] Pan T, Deng J, Liu T, et al., 2025, Effect of Intraoperative Infusion of Esketamine Combined with Dexmedetomidine on Postoperative Sleep Disorders in Patients Undergoing Gynecological Laparoscopic Surgery. Contemporary Medicine Forum, 23(32): 38–41.

[2] Liu M, Ge Q, Li J, et al., 2025, Research Progress on the Effect of Esketamine on Postoperative Anxiety and Depression in Patients Undergoing Gynecological Laparoscopic Surgery. Chinese Journal of Practical Rural Doctors, 32(11): 66–71.

[3] Liu K, Yan B, Liu C, 2023, Clinical Study of Esketamine Injection Combined with Remifentanil Injection in Patients Undergoing Laparoscopic Gynecological Surgery. Chinese Journal of Clinical Pharmacology, 39(11): 1547–1551.

[4] Ma F, Li C, 2024, Preventive Effect of Esketamine on Postoperative Pain and Agitation in Patients Undergoing Gynecological Laparoscopic Surgery. Huaxia Medicine, 37(5): 131–136.

[5] Zhang J, Jin B, 2024, Effect of Esketamine Combined with TAPB on Postoperative Pain and Recovery in Patients Undergoing Gynecological Laparoscopic Surgery. Chinese Journal of Family Planning, 32(6): 1317–1321.