Advances in Obstetrics and Gynecology Research, 2023, Volume 1, Issue 2
https://ojs.bbwpublisher.com/index.php/AOGR

Application of Multimodal Analgesia Based on the ERAS Concept in Patients Undergoing Laparoscopic Surgery for Gynecological Tumors

Jun Peng, Xiang Shen*, Yanfang Deng, Xinghui Yang, Yuezhimu Buwu

The First People's Hospital of Liangshan Yi Autonomous Prefecture, Xichang 615000, Sichuan Province, China

Corresponding author: Xiang Shen, 0834@live.com

Abstract: *Objective:* The application effect of multimodal analgesia based on the enhanced recovery after surgery (ERAS) concept in patients undergoing laparoscopic surgery for gynecological tumors. *Methods:* 48 patients with laparoscopic surgery for gynecological tumors were included, selected from January to December 2022, and randomly divided into the control group and observation group, with 24 cases in each group, to compare the effects. *Results:* The pain scores at each time point in the observation group were lower than those in the control group, and the recovery time of analgesic gas and out-of-bed activity, and postoperative length of stay were shorter than those in the control group ($P < 0.05$). *Conclusion:* Laparoscopic technology brings benefits to patients with gynecological tumors, realizes minimally invasive treatment, and reduces damage, but postoperative pain is still a key factor affecting prognosis. Multimodal analgesia based on the concept of ERAS can play a significant role in relieving pain, which has an important impact on improving the physical and mental state of patients and accelerating postoperative recovery.

Keywords: Gynecologic tumors; Laparoscopic surgery; ERAS concept; Multimodal analgesia; Total satisfaction with analgesia

Online publication: September 21, 2023

1. Introduction

During the perioperative perio.d, enhanced recovery after surgery (ERAS) is a very important concept, which aims to minimize the physical and mental stress response of postoperative patients through a series of optimized treatment measures and create good conditions for rapid recovery [1-4]. Gynecological tumors such as uterine fibroids occur frequently in clinical practice. Surgical removal of tumor tissue is the key to cure. Especially after the popularization of laparoscopic technology, the advantages of minimally invasive surgery have been affirmed by more people, and patients' subjective willingness to choose is strong. Therefore, the number of laparoscopic surgeries for gynecological tumors has increased significantly in recent years [5,6]. But even though laparoscopic surgery has many promotional advantages worthy of everyone's recognition, the postoperative pain will inevitably lead to trauma, which is a source of physical and mental stress. Studies have shown that under the influence of multiple factors such as laparoscopic pneumoperitoneum, vaginal stump, uterus, and

accessory damage, patients have different degrees of postoperative pain perception, and women are sensitive to pain and cannot tolerate it. Postoperative pain may become an important factor hindering postoperative recovery. Therefore, for laparoscopic treatment of gynecological tumors, postoperative analgesia is very important [7,8]. The concept of ERAS is advanced in surgery, and multimodal analgesia under its guidance can exert a more powerful analgesic effect.

Oxycodone is a semi-synthetic opioid extracted from the alkaloid thebaine. It is a unique δ-opioid receptor (DOR) and κ-opioid receptor (KOR) agonist with low affinity. Its analgesic mechanism is quite special, as it acts on the central nervous system terminal cell membrane μ-opioid receptors (MOR) [9], reducing or blocking the transmission of C fibers to neurons in the dorsal horn of the spinal cord, thereby preventing or delaying pain, and may also exert an analgesic effect on visceral pain by acting on organs composed of smooth muscles through the KOR [10]. The drug has a strong analgesic effect, quick onset, long-acting time, small adverse reaction, and a unique strong analgesic effect on visceral pain.

In addition, with the development and application of visualization technology, real-time ultrasound guidance technology is adopted, the direction of needle insertion can be dynamically monitored, and the positions of blood vessels, nerves, muscles, and abdominal organs can be displayed to achieve precise positioning and improve the success rate and safety of blockade. Nerve block technology has been widely used. The purpose of peripheral nerve block is to block the conduction of surgical injury stimuli, avoid the formation of central nervous sensitization, and help prevent the occurrence of hyperalgesia and paresthesia [11]. The perfect analgesic effect can reduce the dosage of opioids during the operation, has little impact on the pathophysiology of the patient's system, and can reduce postoperative complications.

Based on this, 48 patients were included in this study to conduct a comparative analysis of the multimodal analgesic effect based on the concept of ERAS, as follows.

2. Materials and methods

2.1. General information

A total of 48 patients undergoing laparoscopic surgery for gynecological tumors were selected from January to December 2022 and randomly divided into the control group and the observation group, with 24 cases in each group. The patients in the two groups were 21–53 years old (42.15 ± 5.36) years old and 21–54 years old (42.24 ± 5.19) years old, body weight of 67.59 ± 5.23 kg and 67.48 ± 5.19 kg, anesthesia time of 70.25 ± 10.23 min and 70.19 ± 10.45 min, operation time of 63.58 ± 12.15 min and 64.01 ± 13.59 min, and VAS score grade I/II of 15/9 (62.50%/37.50%) and 14/10 (58.33%/ 41.67%), respectively. The difference between the two groups of data is insignificant ($P > 0.05$).

Inclusion criteria included: (1) visual analog scale (VAS) grade I~II; (2) complete general information; (3) informed research, signed informed consent accompanied by family members.

Exclusion criteria included: (1) operation time < 0.5h or > 2h; (2) conversion to laparotomy; (3) opioid or alcohol dependence; (4) liver and kidney dysfunction.

2.2 Methods

Routine analgesia group (control group): VAS scoring method was used to understand the pain severity of patients after the operation, and analgesic drugs and analgesic programs were selected according to needs.

Multimodal analgesia group based on the ERAS concept (observation group):

(1) Guided by the ERAS concept, a working group is established to be responsible for postoperative pain relief. Members come from various departments. They need to study the ERAS concept, the

latest technical knowledge, and normative requirements for pain management together. All members cooperate to improve postoperative pain relief management. Before the operation, patients need to be informed of the key content of ERAS multimodal analgesia, including perioperative pain management and postoperative rehabilitation process, to help patients grasp the advantages and disadvantages of each analgesic method, and to have an accurate understanding of the expected postoperative pain, so as to obtain the cooperation of patients and their families to promote the smooth progress of postoperative rehabilitation.

(2) Multimodal analgesia: 0.05 mg/kg midazolam + 0.3 mg/kg etomidate + 0.3 μg/kg sufentanil + 0.6 mg/kg rocuronium bromide is selected for anesthesia induction, followed by endotracheal intubation and intermittent positive pressure ventilation. After anesthesia induction, bilateral transversus abdominis plane block + rectus sheath block (0.25% ropivacaine 40 mL) was performed under the guidance of ultrasound. Remifentanil, propofol, and sevoflurane were used for maintenance of anesthesia, and the medication was adjusted according to the patient's vital signs and body movement response, and rocuronium bromide was selected as an additional anesthetic drug based on actual needs. Ten minutes before the end of the operation, 3 mg granisetron was selected + 0.1mg/kg oxycodone hydrochloride injection intravenously. The patient-controlled intravenous analgesia pump (PCIA) was connected after the endotracheal tube was removed, 100 μg sufentanil + 10 mg dezocine + 6 mg granisetron + 110 mL of 0.9% sodium chloride was given (total dose of 120 mL), according to 2.0 mL/h background dose, 1.0 mL/single dose, and 20 min lock-in time for analgesia.

(3) Pain care: The fluctuation of physical signs was strictly monitored and analyzed regularly. The VAS scoring method was used to understand the changes in the patient's pain level and determine whether the pain is within the tolerance range. To achieve the purpose of pain relief, the wound must be kept dry and clean, and the dressing should be updated in time if exudate or blood is found, so as to strengthen infection prevention.

2.3 Observation indicators

The observation indicators in this study included:

(1) Pain score: the VAS scoring method was chosen to evaluate the pain degree immediately after extubation, 4h, 8h, 12h, 24h after operation, etc. The score is between 0 and 10, and the high score indicated the degree of pain.

(2) Clinical indicators: recovery time of analgesic gas, recovery time of out-of-bed activity, postoperative length of stay.

(3) Negative emotion: sedation agitation scale (SAS) and standard deviation scores (SDS) were selected for investigation, and the lowest score indicated the least negative emotion.

(4) Analgesic satisfaction: A self-made questionnaire was used to conduct the survey. "0-59 points", "60-89 points", and "90-100 points" corresponded to dissatisfied, relatively satisfied, and satisfied, respectively. The sum of the last two items was added to obtain the total satisfaction rate.

2.4 Statistical methods

The SPSS20.0 statistical software was used to process data. The measurement data were represented by mean ± standard deviation (SD), and the *t*-test was used. Enumeration data were expressed in %, and the χ^2 test was used. $P < 0.05$ means the difference is statistically significant.

3. Results

3.1 Comparison of pain scores between the two groups

The pain scores at each time point in the observation group were lower than those in the control group ($P < 0.05$). See **Table 1**.

Table 1. Comparison of pain scores between the two groups (mean ± SD, points)

Group	Number of cases	Immediate extubation	4 hours after the operation	8 hours after the operation	12 hours after the operation	24 hours after the operation
Observation group	24	2.08 ± 0.49	3.12 ± 0.56	2.77 ± 0.85	2.64 ± 0.74	2.47 ± 0.54
Control group	24	3.88 ± 1.02	5.52 ± 0.41	4.13 ± 1.02	3.96 ± 1.02	3.73 ± 0.69
t		7.793	16.941	5.018	5.132	7.045
P		0.000	0.000	0.000	0.000	0.000

3.2. Comparison of clinical indicators between the two groups

The recovery of analgesic gas, recovery of getting out of bed, and hospitalization time in the observation group were shorter than those in the control group ($P < 0.05$). See **Table 2**.

Table 2. Comparison of clinical indicators between the two groups (mean ± SD)

Group	Number of cases	Recovery time of analgesic gas (h)	Recovery time of out-of-bed (h)	Postoperative length of stay (d)
Observation group	24	15.76 ± 3.25	17.33 ± 4.25	5.25 ± 1.34
Control group	24	24.47 ± 4.26	23.46 ± 4.69	6.70 ± 1.19
t		7.964	4.745	3.964
P		0.000	0.000	0.000

3.3 Comparing negative emotions between the two groups

The SAS and SDS scores of the observation group were lower than those of the control group, ($P < 0.05$). See **Table 3**.

Table 3. Comparison of negative emotions between the two groups (mean ± SD, points)

Group	Number of cases	SAS	SDS
Observation group	24	32.15 ± 5.36	32.26 ± 5.48
Control group	24	43.25 ± 5.69	43.54 ± 5.78
t		6.957	6.938
P		0.000	0.000

3.4 Comparing the satisfaction degree of analgesia between the two groups

The total satisfaction with analgesia in the observation group was higher than that in the control group ($P < 0.05$). See **Table 4**.

Table 4. Comparison of the satisfaction degree of analgesia between the two groups [n (%)]

Group	Number of cases	Satisfied	Relatively satisfied	Dissatisfied	Total satisfaction rate
Observation group	24	12 (50.00)	10 (41.67)	2 (8.33)	22 (91.67)
Control group	24	6 (25.00)	10 (41.67)	8 (33.33)	16 (66.67)
x^2		3.200	0.000	4.547	4.547
p		0.074	1.000	0.033	0.033

4. Discussion

Laparoscopic surgery is generally the first choice for gynecological tumors, and its small trauma creates a prerequisite for the rapid recovery of patients after surgery compared with open surgery. Numerous studies have confirmed that laparoscopic surgery does not have a significant difference in achievement as compared to open surgery. In addition to the curative effect, the pain is lighter and the postoperative scar is smaller [12,13]. One of the important reasons why patients who choose minimally invasive surgery in current clinical practice can be discharged sooner is that the degree of postoperative pain is less. However, the damage caused by surgical operations cannot be ignored. After the surgical anesthesia subsides, the pain will gradually return. The tissue and organ damage and incision caused by the operation will bring a certain amount of pain, regardless of the individual's sensitivity and tolerance to pain. The degree of acceptance is different. If the pain cannot be effectively relieved, severe pain will become an important incentive for the occurrence of adverse physical and mental stress reactions [14]. This will have an extremely adverse effect on postoperative rehabilitation. Therefore, it is clinically believed that after laparoscopic surgery for gynecological tumors, it is necessary to carry out reasonable and scientific management of postoperative pain. The concept of ERAS calls for a variety of optimized treatment measures to be focused on during the perioperative period in order to minimize or even directly avoid adverse physical and mental stress reactions after surgery, to maintain the patient's physical and mental state in a relatively stable and better state, and to create favorable conditions for rapid postoperative recovery [15,16]. The main points of the multimodal analgesic management based on the concept of ERAS included: (1) determine the unified standard of pain assessment, improve the health education for patients, assist patients to understand and cooperate with various analgesic measures, so that they can have accurate anticipation of pain; (2) PCIA is one of the important modes of patient-controlled analgesia, and its biggest advantage lies in its wide range of applications and more types of drugs available. However, it has also been reported that this method can not directly block the pain sensation at the surgical site when it acts on the central nervous system, and a higher concentration of analgesic drugs is required to achieve postoperative pain-free effects. Therefore, opioid dosage is required to be strictly controlled to avoid adverse effects on the whole body [17,18].

Among the 48 patients included in this study, the analysis found that the pain scores of the observation group at each time point were lower than those of the control group, the recovery time of analgesic gas, the recovery time of out-of-bed, and the hospitalization time were all shorter than those of the control group, and the SAS and SDS scores were lower than those of the control group, with a higher total satisfaction degree of analgesia ($P < 0.05$). It can be seen from the results that multimodal analgesia based on the ERAS concept can optimize the clinical indicators, strengthen the analgesic effect, improve the patient's mentality, and accelerate the recovery of the patient, with outstanding value.

In summary, laparoscopic technology brings benefits to patients with gynecological tumors, realizes

minimally invasive treatment, and reduces damage, yet postoperative pain is the key factor affecting prognosis, so it is essential to strengthen postoperative pain management. Multimodal analgesia based on the concept of ERAS can play a significant role in pain relief, improve the physical and mental state of patients, and create favorable conditions for rapid postoperative recovery.

Disclosure statement

The authors declare no conflicts of interest.

References

[1] Chen Y, Qian K, Zheng G, et al., 2020, Application Status of Multimodal Analgesia under ERAS Concept in Gynecological Laparoscopic Surgery. World Latest Medical Information Abstracts, 20(24): 57–58.

[2] Jiang L, Tong D, Feng Z, et al., 2018, Application of ERAS in Laparoscopic Surgery for Uterine Fibroids. Advances in Modern Obstetrics and Gynecology, 27(9): 686–688 + 692.

[3] Ling J, Du X, Huang J, 2022, Clinical Application of Integrated Traditional Chinese and Western Medicine Accelerated Rehabilitation Surgery in the Perioperative Period of Laparoscopic Uterine Fibroids. Research of Integrative Traditional Chinese and Western Medicine, 14(4): 243–246 + 258.

[4] Zhu X, Yang X, Peng G, 2020, Application of Accelerated Rehabilitation Surgery Combined with Clinical Pathway Intervention in Laparoscopic Surgery for Uterine Fibroids. Modern Practical Medicine, 32(12): 1536–1538.

[5] Qiu Y, 2020, The Effect of Aerobic Posture Rehabilitation Exercises Based on the Concept of ERAS on the Recovery Quality of Patients Undergoing Gynecological Laparoscopy. Electronic Journal of Clinical Medicine Literature, 7(97): 4–6.

[6] Lian G, Huang W, Xu H, et al., 2020, Application of ERAS Nursing Concept in Patients with Minimally Invasive Surgery for Gynecological Malignant Tumors. Qilu Journal of Nursing, 26(24): 61–63.

[7] Chen W, 2019, Application of Multimodal Analgesia with Transversus Abdominis Plane Block Combined with Flurbiprofen Axetil in Gynecological Laparoscopic Surgery. North Pharmacy, 16(9): 12–14.

[8] Wei W, Fang Z, Ma Y, et al., 2022, The Analgesic Effect of Transcutaneous Electrical Nerve Stimulation Combined with Accelerated Rehabilitation Surgery Multimodal Analgesia After Laparoscopic Hysterectomy. Journal of Practical Medicine, 38 (10): 1251–1254.

[9] Kokki H, Kokki M, Sjovall S, 2012, Oxycodone for the Treatment of Postoperative Pain. Expert Opinion on Pharmacotherapy, 13(7): 1045–1058.

[10] Kalso E, 2007, How Different is Oxycodone from Morphine? Pain, 132(3): 227–228.

[11] Ma H, Li H, Che W, et al., 2010, Effect of Ultrasound-Guided Transversus Abdominis Plane Block on Postoperative Analgesia in Patients Undergoing General Anesthesia Hysterectomy. Chinese Journal of Anesthesiology, 30(9): 1025–1027.

[12] Han X, Du L, Ping C, et al., 2020, Effects of Different Analgesic Methods on the Postoperative Rehabilitation of Patients Undergoing Laparotomy Myomectomy Under the Accelerated Rehabilitation Surgery Mode. China Medical Herald, 17(10): 109–112.

[13] Luo H, Wu A, Xiang J, et al., 2018, Effect of Combined General Anesthesia Plus Preventive Analgesia on ERAS in Patients with Complex Gynecological Surgery Under Multidisciplinary Collaborative Diagnosis and Treatment. Guangdong Medicine, 39(12): 1851–1856.

[14] Wu Z, Bo H, Wang Y, et al., 2018, The Application Value of Accelerated Rehabilitation Surgery Concept in Gynecological Perioperative Nursing Intervention. Chinese Journal of Clinical Obstetrics and Gynecology, 19(6):

557–559.

[15] Wang H, Peng J, Tian Y, et al., 2020, Based on the ERAS Concept, a Comparative Study of Postoperative Recovery between Transvaginal Natural Orifice Endoscopic Surgery and Transumbilical Single-Port Laparoscopic Surgery for Benign Ovarian Cysts. Chinese Journal of Cancer Prevention and Treatment, 27(1): 134–135.

[16] Luo H, Jin S, Kuang Y, 2020, The Analgesic Effect of Multimodal Analgesia in Laparoscopic Myomectomy and Its Effect on Stress Response. Medical Clinical Research, 37(5): 702–705.

[17] Zheng J, Zhao Y, Cheng J, 2021, Application Effect of Pain Management Based on the Concept of Rapid Recovery Surgery Combined with Traditional Chinese Medicine Pain Nursing Intervention in Perioperative Care of Patients Undergoing Laparoscopic Day Surgery. Guangxi Medicine, 43(7): 896–899.

[18] Liu L, Huang X, 2022, Effect of Epidural Anesthesia Combined with Multimodal Analgesia on Immune Function and High Mobility Group Box Protein B1 in Patients Undergoing General Anesthesia for Laparoscopic Gynecological Surgery. Chinese Journal of Modern Medicine, 32(24): 79–84.