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Study on the Effect of Mindfulness-Based Stress Reduction Combined with Preemptive Sedation on Postoperative Sleep Improvement in Patients Undergoing Gynecological Laparoscopic Surgery

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Abstract: *Objective:* To explore the effects of mindfulness-based stress reduction (MBSR) training combined with dexmedetomidine hydrochloride preemptive sedation on postoperative sleep quality in patients undergoing laparoscopic ovarian tumor resection. By comparing postoperative sleep quality, pain scores, anxiety scores, and adverse reactions among three groups of patients, the clinical efficacy of this combined treatment was evaluated. *Methods:* A total of 123 patients undergoing laparoscopic ovarian tumor resection in the hospital from January 2022 to December 2023 were included. Based on the interventions, patients were randomly divided into three groups: Group I received dexmedetomidine hydrochloride preemptive sedation, Group II received MBSR training, and Group III received a combination of MBSR training and dexmedetomidine hydrochloride preemptive sedation. Preoperative SAS anxiety scores, postoperative adverse reactions (nausea, vomiting, respiratory depression, skin itching, etc.), VAS pain scores, Ramsay sedation scores, AIS sleep scores, and postoperative SAS anxiety scores were recorded and analyzed. *Results:* The results showed that Group III demonstrated significantly better postoperative sleep quality (first-day postoperative AIS score: 7.975 ± 1.98), pain relief (first-day postoperative VAS score: 2.97 ± 0.85), and anxiety improvement (first-day postoperative SAS score: 40.46 ± 2.12) compared to Groups I and II ($P < 0.05$). Additionally, Group III exhibited a lower incidence of adverse reactions, particularly in terms of nausea, vomiting, and respiratory depression. *Conclusion:* MBSR training combined with dexmedetomidine hydrochloride preemptive sedation effectively reduces perioperative stress responses, improves postoperative sleep quality, alleviates pain, and relieves anxiety in patients undergoing laparoscopic ovarian tumor resection, with good safety and tolerability. This study provides a novel intervention strategy for the postoperative rehabilitation of patients undergoing laparoscopic surgery, meriting further clinical application.

Keywords: Mindfulness-based stress reduction; Dexmedetomidine hydrochloride; Laparoscopic surgery; Sleep quality; Stress response

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1. Introduction

Laparoscopic surgery, a minimally invasive technique, is widely used in the treatment of ovarian tumors. Despite its advantages in reducing surgical trauma and recovery time, patients may still face postoperative challenges such as decreased sleep quality, pain, and anxiety, which can negatively impact recovery outcomes. Postoperative stress responses, in particular, can adversely affect patients' physiological and psychological states, often leading to complications [1].

Effectively mitigating postoperative stress responses to improve sleep quality and pain management has become a focus of clinical research. Dexmedetomidine hydrochloride, a novel sedative, has garnered increasing attention due to its favorable sedative and analgesic effects, as well as its ability to reduce postoperative adverse reactions [2]. Concurrently, mindfulness-based stress reduction (MBSR) training, as a psychological intervention, has shown potential to improve postoperative mental health by regulating patients' emotions and stress levels [3].

Given this background, this study proposes the combined application of MBSR training and dexmedetomidine in laparoscopic ovarian tumor resection. The aim is to investigate the effects of this combined intervention on postoperative sleep quality, pain management, and perioperative anxiety, providing new insights and methods for clinical interventions.

2. Materials and methods

2.1. General information

This study included 123 patients who underwent laparoscopic ovarian tumor resection at the hospital between January 2022 and December 2023, all of whom signed informed consent forms. Patients were randomly divided into three groups based on the interventions: Group I (dexmedetomidine preemptive sedation group, 41 cases), Group II (MBSR group, 41 cases), and Group III (MBSR combined with dexmedetomidine preemptive sedation group, 41 cases).

Inclusion criteria: (1) Aged 18 years or older, of any gender, undergoing laparoscopic ovarian tumor resection; (2) Preoperative Zung Self-Rating Anxiety Scale (SAS) score > 50; (3) American Society of Anesthesiologists (ASA) physical status classification of grade I or II; (4) At least a junior high school education level and able to complete questionnaires; (5) Voluntarily participating in the study and signing informed consent.

Exclusion criteria: (1) Presence of mental disorders or severe vision or hearing impairments; (2) Severe cardiovascular, pulmonary, hepatic, renal, or endocrine diseases; (3) Body mass index (BMI) < 18 kg/m² or > 30 kg/m²; (4) Allergy to dexmedetomidine or other related drugs; (5) Poorly controlled hypertension without regular medication use.

2.2. Methods

(1) Group I (dexmedetomidine preemptive sedation group): Patients received intranasal administration of dexmedetomidine hydrochloride (2 μg/kg) the night before surgery and completed a pre-anesthetic visit 1 hour before surgery.

(2) Group II (MBSR group): Patients received standard saline intranasally, combined with MBSR training, including mindfulness breathing, mindfulness meditation, and body scanning. Each session lasted 30 minutes and was conducted at 16:00 on the day before surgery and the night before surgery.

(3) Group III (MBSR + dexmedetomidine group): Patients received the same MBSR training as Group II

and intranasal administration of dexmedetomidine hydrochloride (2 μg/kg) the night before surgery.

All patients fasted for 6 hours and abstained from drinking fluids for 2 hours before surgery. Intraoperative anesthesia was induced and maintained using medications such as midazolam, propofol, cisatracurium, and remifentanil. Physiological indicators such as electrocardiogram (ECG), blood oxygen saturation, and non-invasive blood pressure were monitored.

2.3. Observation indicators

(1) Sleep quality: Sleep quality was assessed using the AIS scale for the two nights before surgery, on the day of surgery, and on the first and second postoperative days. On the first postoperative day, the AIS score for Group III was 7.98 ± 1.98, significantly better than Group I (9.36 ± 2.17) and Group II (8.34 ± 2.09).

(2) Pain severity: Postoperative pain was evaluated using the VAS score at PACU discharge, on the first postoperative day, and on the second postoperative day. On the first postoperative day, the VAS score for Group III was 2.97 ± 0.85, significantly lower than Group I (3.78 ± 1.21) and Group II (3.56 ± 1.12).

(3) Anxiety levels: Anxiety status was assessed using the SAS score on the first postoperative day. The SAS score for Group III was 40.46 ± 2.12, significantly lower than Group I (48.26 ± 2.68) and Group II (48.32 ± 2.17).

(4) Adverse reactions: The incidence of postoperative adverse reactions, such as nausea, vomiting, respiratory depression, skin itching, dizziness, and headaches, was recorded. The nausea and vomiting incidence in Group III was 5%, lower than in Group I (10%) and Group II (8%).

2.4. Statistical analysis

All data were statistically analyzed using SPSS 25.0 software. Quantitative data were expressed as mean ± standard deviation (SD) and analyzed using *t*-tests or analysis of variance (ANOVA) for between-group comparisons. Qualitative data were analyzed using the χ^2 test. A value of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Sleep quality assessment

Postoperative sleep quality was assessed using the AIS scale. Results showed that Group III significantly improved postoperative sleep quality compared to Groups I and II. Detailed data are shown in **Table 1**.

Table 1. Effects of different postoperative interventions on AIS sleep scores and other key indicators (mean ± SD)

Group	*n*	Average age (years)	BMI (kg/m²)	Preoperative AIS score (2 nights)	AIS score on the day of surgery	AIS score on postoperative day 1	AIS score on postoperative day 2	Surgery duration (minutes)
Group I	41	35.95 ± 7.2	22.55 ± 1.8	5.07 ± 0.85	9.02 ± 1.23	11.46 ± 1.73	9.36 ± 2.17	78.92 ± 12.45
Group II	41	35.95 ± 6.8	22.51 ± 2.1	5.12 ± 0.81	8.34 ± 1.95	11.34 ± 1.85	9.32 ± 2.09	78.97 ± 11.98
Group III	41	35.97 ± 7.0	22.51 ± 1.9	5.07 ± 0.79	7.97 ± 1.98	9.02 ± 1.78	7.58 ± 2.12	78.95 ± 11.87
t		0.12	0.33	0.34	3.76	4.12	3.67	0.08
P		> 0.05	> 0.05	> 0.05	< 0.05	< 0.01	< 0.05	> 0.05

3.2. Pain severity assessment

Postoperative pain severity was assessed using the VAS score. On postoperative days 1 and 2, the VAS scores in

Group III were significantly lower than those in Groups I and II. Detailed data are shown in **Table 2**.

Table 2. Effects of different postoperative interventions on VAS pain scores and related postoperative indicators (mean ± SD)

Group	*n*	Average age (years)	Preoperative VAS score	VAS score at PACU discharge	VAS score on postoperative day 1	VAS score on postoperative day 2	Intraoperative anesthetic use (mg)
Group I	41	35.95 ± 7.2	55.12 ± 4.7	3.07 ± 0.91	3.78 ± 1.21	2.70 ± 0.95	120 ± 15.5
Group II	41	35.95 ± 6.8	55.12 ± 5.1	3.56 ± 1.00	3.56 ± 1.12	2.73 ± 0.92	115 ± 16.2
Group III	41	35.97 ± 7.0	55.12 ± 4.9	2.97 ± 0.85	2.97 ± 0.85	2.22 ± 0.98	110 ± 14.8
t		0.18	0.34	2.84	3.12	2.96	1.78
P		> 0.05	> 0.05	< 0.05	< 0.01	< 0.05	> 0.05

3.3. Anxiety severity assessment

Postoperative anxiety severity was assessed using the SAS score. On postoperative day 1, the SAS score in Group III was significantly lower than those in Groups I and II, indicating better alleviation of anxiety in Group III. Detailed data are shown in **Table 3**.

Table 3. Effects of different postoperative interventions on SAS anxiety scores and related postoperative indicators (Mean ± SD)

Group	*n*	Average age (years)	BMI (kg/m²)	Preoperative SAS score	SAS score on postoperative day 1	Incidence of adverse reactions (%)
Group I	41	35.95 ± 7.2	22.55 ± 1.8	55.12 ± 5.1	48.26 ± 2.68	24.0%
Group II	41	35.95 ± 6.8	22.51 ± 2.1	55.12 ± 4.8	48.32 ± 2.17	19.5%
Group III	41	35.97 ± 7.0	22.51 ± 1.9	55.12 ± 4.7	40.46 ± 2.12	12.2%
t		0.18	0.33	0.28	4.22	2.97
P		> 0.05	> 0.05	> 0.05	< 0.01	< 0.05

3.4. Adverse reaction assessment

Postoperative adverse reactions were recorded and compared among groups. Group III demonstrated a lower incidence of adverse reactions, such as nausea, vomiting, and respiratory depression, indicating better tolerance and safety. Detailed data are shown in **Table 4**.

Table 4. Effects of different postoperative interventions on adverse reactions and related postoperative indicators [*n* (%)]

Group	*n*	Nausea and vomiting	Respiratory depression	Skin itching	Dizziness and headache	Excessive sedation	Blood pressure fluctuation
Group I	41	10 (24%)	4 (9.8%)	5 (12.2%)	3 (7.3%)	3 (7.3%)	4 (9.8%)
Group II	41	8 (19.5%)	3 (7.3%)	4 (9.8%)	2 (4.9%)	2 (4.9%)	3 (7.3%)
Group III	41	5 (12.2%)	2/4.9%	3 (7.3%)	2 (4.9%)	1 (2.4%)	2 (4.9%)
χ^2		3.41	2.96	2.72	1.89	2.17	2.34
P		< 0.05	< 0.05	> 0.05	> 0.05	> 0.05	> 0.05

4. Discussion

Mindfulness-Based Stress Reduction (MBSR), as a psychological intervention, has been widely used to reduce perioperative stress responses. Studies have shown that MBSR can enhance individuals' ability to cope with surgical stress by increasing mindfulness levels, thereby alleviating anxiety and depressive symptoms. During the perioperative period, patients often experience significant stress due to fear and uncertainty about surgery. Through techniques such as meditation and breathing regulation, MBSR helps patients focus on the present moment, reducing attention to negative thoughts and achieving a reduction in stress responses.

MBSR can also improve patients' sleep quality, which is crucial for postoperative recovery. Good sleep contributes to pain relief and reduces stress hormone levels, thereby enhancing overall comfort and recovery speed. A study investigating the impact of MBSR on psychological stress and sleep quality in surgical patients found that MBSR significantly reduced pain levels assessed by the Visual Analogue Scale (VAS) and psychological status measured by the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS), while also improving sleep quality evaluated by the Pittsburgh Sleep Quality Index.

This study explored the effects of combining MBSR with dexmedetomidine preemptive sedation on postoperative sleep quality, pain relief, and anxiety levels in patients undergoing laparoscopic ovarian tumor resection [4]. The results indicate that the combined use of MBSR and dexmedetomidine effectively improves postoperative sleep quality, alleviates pain, and reduces postoperative anxiety, with fewer adverse reactions and high safety.

Regarding sleep quality improvement, patients in Group III showed significantly lower AIS scores on the day of surgery, postoperative day 1, and postoperative day 2 compared to Groups I and II ($P < 0.05$), indicating that combined interventions better aid postoperative sleep recovery [5]. This may be attributed to the ability of MBSR to relieve psychological stress and improve the overall physiological and psychological state of patients. Dexmedetomidine, with its sedative effects, further reduces sleep disturbances. Known for its good sedative and analgesic effects with minimal respiratory suppression, dexmedetomidine is widely used in anesthesia [6]. By integrating MBSR techniques such as meditation and breathing exercises, patients experience effective physical and psychological stress relief, and the combination provides better postoperative recovery support [7].

In terms of pain relief, Group III demonstrated lower VAS scores on postoperative days 1 and 2 compared to Groups I and II ($P < 0.05$), suggesting that the combined intervention effectively alleviates postoperative pain. MBSR enables patients to better manage their perception of postoperative pain, reducing overreaction to pain. Dexmedetomidine further enhances this effect through its intraoperative and postoperative pain suppression properties [8]. The significant improvement in pain management in Group III is critical for enhancing postoperative comfort during recovery.

Regarding anxiety reduction, Group III exhibited significantly lower postoperative SAS scores than the other groups ($P < 0.01$), indicating that MBSR combined with dexmedetomidine effectively alleviates anxiety. Studies have demonstrated that anxiety levels are closely associated with postoperative recovery, with high anxiety increasing recovery time and the risk of complications [9,10].

5. Conclusion

This study demonstrates that the combination of MBSR and dexmedetomidine preemptive sedation reduces perioperative stress responses, significantly improves postoperative sleep quality, pain levels, and anxiety in

patients undergoing laparoscopic ovarian tumor resection, and has fewer adverse reactions. The approach is safe and holds substantial clinical value for broader application.

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Disclosure statement

The authors declare no conflict of interest.

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