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The effects of dexmedetomidine and remimazolam on spinal anesthesia in patients with anxiety disorder: A retrospective case-control study on intraoperative sedation quality and postoperative cognitive function

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Abstract: Anxiety disorder patients are accompanied by significant dysfunction and other problems, clinical treatment faces great challenges. The aim of this study is to investigate the effects of dexmedetomidine and remimazolam on spinal anesthesia in anxiety disorder patients, to provide a clinical reference point. 80 anxiety disorder patients coming to our hospital for intrathecal anaesthesia surgery from June 2022 to June 2024 were divided into control group (n=40) and study group (n=40). Remimazolam was used in both groups and dexmedetomidine was added in study group. The heart rates (HR) and means of arterial pressures (MAP), Ramsay scores, visual analog scale (VAS) and hamilton analysis of metabolic anxiety scale (HAMA) scores, mini-mental state examination (MMSE), montreal cognitive assessment scale (MoCA) scores, serum platelet activating factors (PAF) and interferon gamma (IFN-γ) and adverse reactions were compared among the both groups. Compared to control group, HR and MAP levels, MMSE and MoCA scores, and IFN-γ levels were significantly increased, and Ramsay scores, VAS scores, HAMA scores and PAF levels were significantly decreased in the study group (P<0.05). No significant difference in the adverse reaction incidence of the both groups (P>0.05). Spinal anesthesia with dexmedetomidine and remimazolam provides better anesthesia in anxiety disorders patients.

Keywords: Dexmedetomidine, remimazolam, spinal anesthesia, sedative quality, cognitive function.

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INTRODUCTION

Anxiety disturbances are widespread psychological disorders that are characterized by excessive worry and fear in daily situations, interference with daily activities, and difficulty in control (Szuhany and Simon, 2022). The main treatment methods for anxiety disorders include psychotherapy and medication. Psychotherapy mainly includes cognitive-behavioral therapy and supportive psychotherapy, while medication includes benzodiazepines, non-benzodiazepines and antidepressants. The prognosis of anxiety disorders is generally good, but poor treatment may lead to depressive disorders (DeMartini *et al*., 2019). Surgical anxiety is quite common in clinical practice, often leading to elevated blood pressures and heart rates in patients. In severe cases, it may trigger psychological reactions such as suicide and world weariness. Intraoperative general anesthesia drugs mainly exert analgesic and sedative effects by activating inhibitory GABA receptors (gamma-aminobutyric acid receptors) and blocking the ascending system of the cerebral reticular formation (Brown *et al*., 2018). Some general anesthesia drugs, such as remimazolam, are also sedatives, antidepressants and anxiety drugs. Drug dependence is not uncommon in depressed patients, but there are few clinical reports on the different anxiety responses of anxiety patients and normal populations when facing surgical stress.

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Intravertebral anesthesia surgery is a method of pain control and surgical treatment by injecting anesthetic drugs into the spinal canal, which can be divided into subarachnoid block anesthesia, lumbar-hard joint anesthesia, epidural block anesthesia, sacral block anesthesia and so on (Panchamia *et al*., 2020). Intraspinal anesthesia is widely used in labor analgesia, which can effectively reduce pain during childbirth and improve the delivery experience of mothers. For some abdominal and lower limb surgeries, spinal anesthesia can also provide good analgesic effects and reduce pain during and after surgery (Yoon *et al*., 2017). Spinal anesthesia is a local anesthesia method that achieves local anesthesia and analgesia by injecting anesthetic drugs into the spinal canal. Compared with general anesthesia, spinal anesthesia has less impact on the cardiovascular and respiratory systems and patients recover faster after surgery (Neuman Mark *et al*., 2021). Intraspinal anesthesia has higher precision and locality, with less impact on physiological functions. It can accurately act on the painful area and provide more effective local analgesic effects, making it suitable for surgeries and treatments that require local anesthesia (Garg *et al*., 2022). Studies have shown that compared to general anesthesia, spinal anesthesia can reduce mortality and hospitalization rates in joint replacement surgery (Warren *et al*., 2020). However, patients may experience adverse reactions such as elevated blood pressure and increased heart rate due to fear of the surgical environment and invasive procedures. Therefore, appropriate sedation

during spinal canal puncture can help alleviate patients' anxiety and tension, providing them with a comfortable medical experience (Permadi *et al*., 2024).

Dexmedetomidine has significant anxiolytic, sedative and analgesic effects. As an alpha 2-adrenergic receptor agonist, dexmedetomidine has anti sympathetic, sedative, amnesiac, anti-inflammatory, and analgesic properties, which can inhibit excessive excitation of the nervous system, reduce vascular constriction and blood pressure fluctuations, thereby helping to maintain stable vital signs in patients. In addition, dexmedetomidine can also increase blood oxygen saturation in patients undergoing single lung ventilation, which is particularly important for patients who require complex surgery or mechanical ventilation (Liu *et al*., 2021). Remimazolam is a novel drug based on midazolam, which combines carboxylic acid ester side chains with structural modifications similar to remimazolam. Therefore, remimazolam has the characteristics of two drugs, midazolam and remimazolam. Like midazolam, it acts on gamma aminobutyric acid (GABA) receptors and like remimazolam, it is independent of organ metabolism. It is a novel ultra-short-acting benedryl tranquilizer for anesthetic drugs with good anti anxiety and hypnotic sedative effects. It has the advantages of small respiratory and circulatory inhibition and fast onset, and does not undergo liver or kidney metabolism, with no drug accumulation (Kim, 2022). Mainly used in the fields of painless diagnosis and treatment sedation, general anesthesia, local anesthesia sedation, etc., to increase chloride ion influx, inhibit neuronal activity, and thus exert sedative effects (Kilpatrick, 2021). However, there have been no specific studies on the effects of dexmedetomidine and remimazolam on patients with anxiety disorders during spinal anesthesia. Therefore, the purpose of the research is to investigate a retrospective case-control study on the quality of intraoperative sedation and postoperative cognitive function to analyze the combination of dexmedetomidine and remimazolam in the treatment of anxious patients and to provide a scientific basis for the reduction of surgical risk.

MATERIALS AND METHODS

Clinical data

Research subjects: 80 patients with anxiety disorders admitted and prepared for spinal anesthesia from June 2022 to June 2024 were selected as the research subjects. The electronic medical record system was used to collect patient data, including general information such as age, gender, and disease duration.

Inclusion criteria: (1) Meets the diagnosis standard for anxieties and depressions in the Chinese Categories and Diagnosis Standards for the Mental Disturbances (CCMD-3) (Zhu *et al*., 2023) and the onset time is ≥6 months; (2) Ages are among 18-60 years old; (3) All patients meet the indications for spinal anesthesia surgery; (4) American Society of Anesthesiologists (ASA) grades I-II; (5) The first method is to use general anesthesia surgery to treat related surgical diseases; (6) The patients are accompanied by their family members and undergo surgery at a scheduled time, with informed consent from both the patients and their family members.

Exclusion criteria: (1) accompanied by HIV, tuberculosis, hepatitis B and other infectious diseases; (2) major organ diseases; (3) family genetic history of psychiatric disorders; (4) those who fail to complete follow-up according to medical advice; (5) pregnant women; (6) those who have recently used painkillers; (7) other situations that are not suitable for inclusion after research and discussion.

Grouping and treatment methods

All the patients were randomized into study group (n=40) and control group (n=40). After entering the operating room, all patients optimized their positions, routinely opened their upper limb veins and monitored routine indicators such as electrocardiogram, blood pressure, and blood oxygen. Before anesthesia, 8mL/kg of sodium lactate Ringer's solution (National Medical Products Administration Standard H20055488; specification: 1000 mL) was infused. After selecting the L2-3 space of the lumbar spine as the puncture site, routine disinfection and cloth laying were performed. A mixture of 0.5% ropivacaine (National Medical Products Administration Approval H20050325; specification: 75mg) and physiological saline (0.9% NaCl, 500mL) was injected into the subarachnoid vein for subarachnoid anesthesia. After the level of spinal anesthesia stabilizes, the control group patients are given a loading dose of 0.06 mg/kg remimazolam (National Medical Products Administration Standard H20200006; specification: 25 mg; calculated as $C_{21}H_{19}BrN_4O_2$), followed by an additional dose of 0.02 mg/kg every 15 min, with a maximum dose not exceeding 0.12 mg/kg. The study group patients received a loading dose of 0.3μg/kg dexmedetomidine (National Medical Products Administration Standard H20090248; specification: 2mL: 200ug; calculated as $C_{13}H_{16}N_2$) on top of the control group. The infusion was completed within 10 min, and then maintained at 0.15μ/kg/h. After satisfactory anesthesia, routine surgery is performed. If the patient has bradycardia during the operation, 0.5-1 mg atropine (National Medical Products Administration H34021900; specification: 1mL: 0.5 mg) should be used to correct it. If the blood pressure is too low, 5-20 mg ephedrine (National Medical Products Administration H41021180; specification: 1mL: 30 mg) should be given to correct it. When respiratory depression occurs, oxygen should be administered through a mask and the patient should be sent to the anesthesia recovery room after surgery.

Study indicators

Analysis of heart rate (HR) and mean arterial pressure (MAP)

Refer to the method of Zhou *et al*. (2022), The patient's HR and MAP were recorded using a monitor (Xuzhou Yongkang Electronic Technology Co., Ltd., SuXie Zhuzhun 20162210844, model: YK-8000A) before and after anesthesia.

Postoperative ramsay score

Compare the Ramsay scores of two groups immediately upon awakening and upon exiting the operating room.

VAS score

According to the method of Faraz *et al*. (2023), compare the analgesic effects of two groups of patients. At the moment of awakening, when leaving the operating room, and 6 h after surgery, the patient's pain level was evaluated using the VAS pain score. The highest total score was 10 points, with 0 points indicating no pain and 10 points indicating unbearable severe pain.

HAMA score

The HAMA score is listed as an important diagnostic tool for anxiety disorders in the CCMD-3 *Chinese Diagnostic Criteria for Mental Disorders (Y. Li et al., 2014)*. According to the information provided by the scale collaboration group: ≥29 points, probably indicates significant anxieties; ≥21 points, definitely has marked anxieties; ≥14 points, definitely anxieties; ≥7 points, probably anxieties; ≤7 points, no symptoms of anxieties. The HAMA scores were utilized to compare and assess the depressive status in both groups of patients at preoperative, postoperative 1 d and 3 d.

Mini mental state examination (MMSE) score

Compare the scores of the MMSE between two groups at preoperative, postoperative 1 d and 3 d.

Montreal cognitive assessment scale (MoCA) score

Evaluate patients' cognitive function using the Montreal Cognitive Assessment Scale (MoCA) on preoperative, postoperative 1d, and postoperative 3 d (Linassi *et al*., 2022) and the maximum total score is 30 points. The MoCA score of ≥ 26 is considered normal, while a score of < 26 indicates abnormal cognitive function. The lower the score, the worse the cognitive ability.

Serological indicator analysis

Referring to the method of Upton *et al*. (2022) and making simple modifications, the levels of platelet activating factor (PAF) and interferon gamma (IFN-γ) in the serum of each group of patients were detected, and the patients were kept on an empty stomach in the morning. The 3mL serum sample from the superficial elbow vein was collected for content detection. Our laboratory uniformly used the ELISA method to detect serum samples and the ELISA Kit for Platelet Activating Factor (PAF) (CEA526Ge, Cloud Clone Corp.) and Human IFN-γ (Interferon Gamma) ELISA Kit (CRS-B006, ACRO Biosystems) were used to detect the PAF and IFN-γ levels in the serum according to the instructions.

Incidence of adverse reactions

Adverse reactions such as injection pain, respiratory depression, nausea, vomiting, dizziness and other adverse reactions during the treatment period were recorded to assess the incidence of adverse reactions in both groups.

Sample size calculation

A power analysis was conducted in this study to determine the sample size required to detect statistically significant differences. The sample size was calculated based on the primary outcome of what happens to cognitive function after surgery. The results of the study at an alpha level of 0.05 and a power of 90% showed that a sample size of 32 patients per group was required. Therefore, the sample size of this study was chosen to be 40 patients per group in order to draw reliable conclusions. The study was conducted using G*Power 3.1.9.7 software.

Ethical approval

This experiment was approved by Shandong Provincial Third Hospital Ethics Committee (KYLL-2025015).

STATISTICAL ANALYSIS

Data were analyzed using SPSS 25.0 (SPSS, USA) statistical software. Plotting was performed using GraphPad Prism 9.1 (GraphPad Software, USA) plotting software. Count data is expressed as n (%), inter group comparison is expressed as chi square test, normally distributed metric data is expressed as mean ± standard deviation ($\bar{x}$±s), and inter group comparison is expressed as independent sample t-test, and $P<0.05$, which indicates a statistically significant difference.

RESULTS

Patient's basic information

The total of 80 patients participated in this study, as shown in table 1. Among them, 40 patients received remimazolam anesthesia and 40 patients received dexmedetomidine combined with remimazolam anesthesia. The difference in baseline characteristics between these two groups was not statistically significant, minimizing the risk of confounding variables that may affect the study results.

Analysis of HR and MAP

Comparative results of HR and MAP among both groups of patients are shown in table 2. After treatment, the HR and MAP of both groups of patients decreased compared to before treatment and were significantly higher in the study group than in the control group ($P<0.05$).

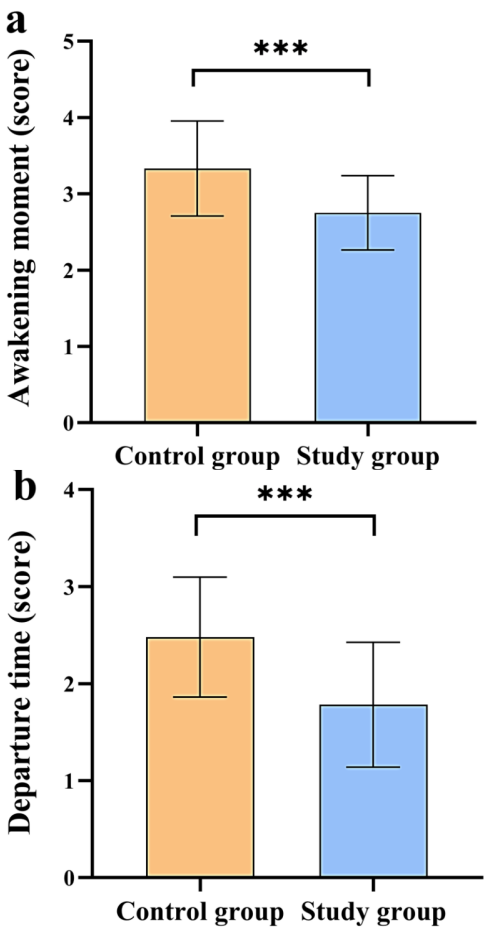

Fig. 1: Ramsay score (a: Ramsay score at awakening moment; b: Ramsay score at departure time of the operating room, "***" indicating $P<0.001$)

Postoperative ramsay score

Comparison of Ramsay scores of both groups of patients is demonstrated in fig. 1. After surgery, the Ramsay scores of patients in both groups were significantly higher at the awakening moment than at the departure time of the operating room ($P<0.05$). Ramsay scores were significantly lower in the study group than in the control group ($P<0.05$).

VAS score

No significant differences between the VAS pain scores of both groups of patients at the awakening moment compared to the departure time of the operating room are shown in table 3 ($P>0.05$). At postoperative 6 h, the VAS pain scores were significantly higher in both groups than at the awakening moment, while the VAS pain scores were significantly lower in the study group than in the control group ($P<0.05$).

HAMA score

The HAMA scores of two groups of patients at different time points are shown in fig. 2. No significant difference was found in preoperative anxiety scores between the two groups ($P>0.05$). The HAMA scores of the study group were significantly below the control group on the postoperative 1 d and 3 d ($P<0.001$).

MMSE scores

The scores of the MMSE of the two groups in patients are shown in fig. 3. There was no statistically significant difference in preoperative MMSE scores ($P>0.05$). The MMSE scores of the study group were significantly below the control group at postoperative 1d and 3d ($P<0.05$).

MoCA score

The comparison of MoCA scores between two groups of patients is shown in fig. 4. Compared with preoperative levels, the MoCA scores of both groups decreased significantly on postoperative 1 d and increased significantly on postoperative 3 d (both $P<0.05$). The postoperative MoCA scores of the study group patients were significantly better than the control group ($P<0.05$).

Serological indicator analysis

The analysis results of serological indicators for the two groups of patients are shown in table 4. After surgery, patients in both groups had significantly increased PAF levels ($P<0.001$), while IFN-γ levels were significantly decreased ($P<0.001$). The changes in PAF and IFN-γ levels were better in the study group than in the control group (both $P<0.05$).

Incidence of adverse reactions

The results of the assessment of adverse reactions before and after treatment in both groups are shown in table 5. The total incidence of adverse reactions was 12.5% (5/40) in the control group and 7.5% (3/40) in the study group, and no significant difference was found between the two groups ($x^2=10.960$, $P=0.090$).

DISCUSSION

Currently, according to statistics, the global overall prevalence of preoperative anxiety among surgical patients is as high as 48% and for patients with anxiety disorders, this proportion may be even higher (Abate *et al*., 2020). Anxiety may increase the risk of intraoperative anesthesia by inducing increased sympathetic nervous system excitability, leading to increased heart rate, coughing and other symptoms. At the same time, severe anxiety may worsen the patient's condition (La Rovere *et al*., 2022), therefore, studying the impact of surgery on anxiety in patients with anxiety disorders has important clinical significance. Amiri *et al*. (2020) reported that some people experience increased anxiety during surgery and anesthesia, with at least 50.8% of surgical patients experiencing preoperative anxiety. Garakani *et al*. (2020) found that long-term oral administration of drugs such as ketamine in patients with anxiety disorders leads to a certain tolerance to sedatives, analgesics and other drugs, which may be one reason why general anesthesia drugs do not improve anxiety in such patients.

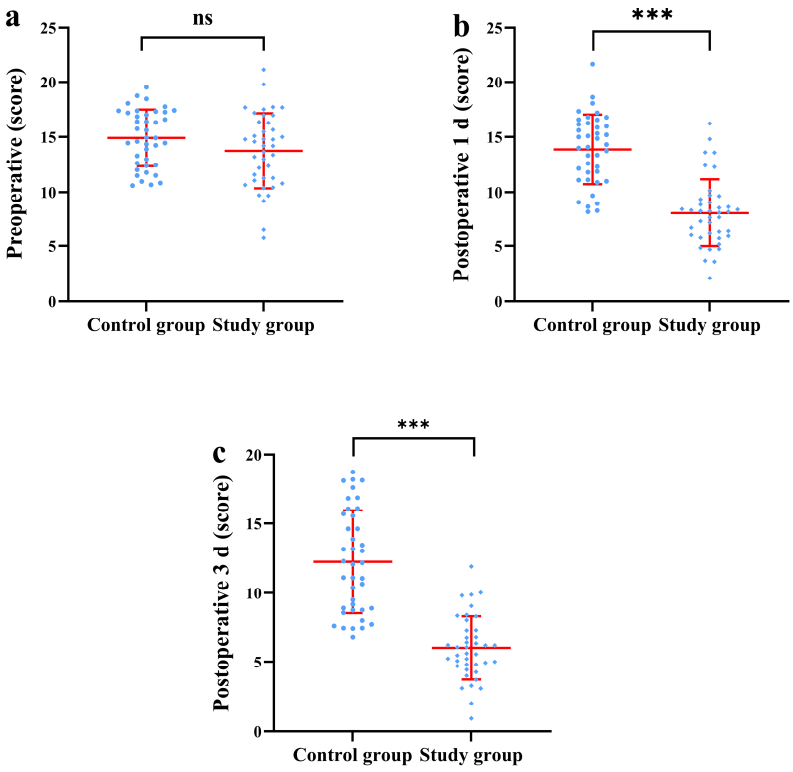

Fig. 2: HAMA score (a: HAMA score at preoperative; b: HAMA score at postoperative 1 d; c: HAMA score at postoperatively 3d; "ns" and "***" represent no significant difference and P<0.001, respectively.)

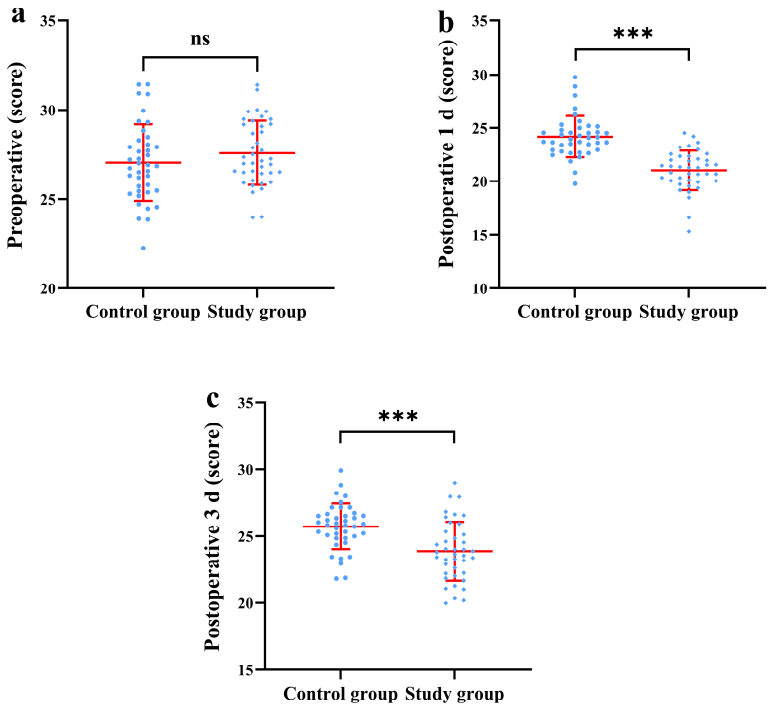

Fig. 3: Brief Mental State Examination (MMSE) scores (a: Preoperative MMSE score; b: MMSE score at postoperatively 1 d; c: MMSE score at postoperatively 3 d; "ns" and "***" represent no significant difference and P<0.001, respectively.)

Table 1: Baseline characteristics of patients in each group

Parameter	Control group (n=40)	Study group (n=40)	t/x^2	P
Age (years)	46.03±7.76	47.33±7.01	0.786	0.434
Gender (Male/Female)	25/15	23/17	2.170	0.903
Weight (kg)	63.84±7.59	61.96±10.35	-0.926	0.357
Intraspinal puncture time (min)	6.99±1.37	7.22±1.27	0.779	0.439

Table 2: Comparison of HR and MAP in patients among both groups ($\bar{x}\pm s$)

Group	Time	HR	MAP
Control group (n=40)	Pre-anesthesia	74.17±5.74	105.78±10.74
	Post-anesthesia	58.05±2.58**	77.18±2.67**
Study group (n=40)	Pre-anesthesia	74.82±5.18	108.19±11.13
	Post-anesthesia	64.17±2.89**△	83.90±3.01**△

Note: Compared to the pre-anesthesia values within the same group (P<0.05), and in comparison to the post-anesthesia control group (P<0.05), both "**" and "Δ" are used to indicate P<0.05.

Table 3: Comparison of VAS scores between two groups of patients ($\bar{x}\pm s$, score)

Group	Awakening moment	Departure time	Postoperative 6 h
Control group (n=40)	2.43±0.70	2.39±0.60^n	3.61±0.53***
Study group (n=40)	2.25±0.46	2.31±0.56^n	3.10±0.58***
t	-1.359	-0.616	-4.105
P	0.178	0.539	<0.05

Note: The VAS scores of patients at the departure time of the operating room and postoperative 6 h of the two groups were compared with the VAS scores at the awakening moment, where "n" represents no significant difference and "***" represents P<0.001

Table 4: Analysis of Serological Indicators ($\bar{x}\pm s$)

Group	PAF (mmol/L)		IFN-γ (ng/L)	
	Preoperative	Preoperative	Preoperative	Preoperative
Control group (n=40)	0.86±0.08	1.50±0.10***	147.03±25.85	73.76±8.64***
Study group (n=40)	0.88±0.06	1.19±0.09***	140.15±28.24	83.86±10.78***
t	1.265	-14.573	-1.137	4.624
P	0.210	<0.05	0.259	<0.05

Note: The comparison of PAF and IFN-γ levels between two groups of patients on postoperative and preoperative, "***" represents P<0.001

Table 5: Incidence of undesirable reaction in two groups of patients

Group	Postoperative injections painful	Inhibited respirations,	Nausea and vomiting	Dizzy	total	x^2	P
Control group (n=40)	1	1	1	2	5(12.5%)	10.963	0.090
Study group (n=40)	2	0	0	1	3(7.5%)		

In addition, the gray matter volume of the right temporal lobe cortex in patients with anxiety disorders is reduced compared to non-anxiety depression, indicating that the microstructure of neurons or glial cells in their local brain regions is abnormal, and their perception or thinking abilities are significantly reduced. This may also be another important reason why general anesthesia surgery has a relatively small impact on the anxiety state of patients with anxiety disorders (Wang *et al*., 2016).

Intraspinal anesthesia is the direct action or diffusion of anesthetic drugs to the corresponding spinal nerves and spinal cord surfaces, in order to reduce tension, eliminate pain, and induce muscle relaxation and other anesthetic effects (Kloesel and Davidyuk, 2017), at the same time, during spinal anesthesia, the metabolism rate of anesthetic drugs is fast and the residual amount in the body is small, which can reduce the damage to the body (Hermanns *et al*., 2022), thus causing less cognitive impairment to patients. Dexmedetomidine can prevent postoperative cognitive dysfunction through multiple pathways and produce neuroprotective effects (Lee, 2019) and the

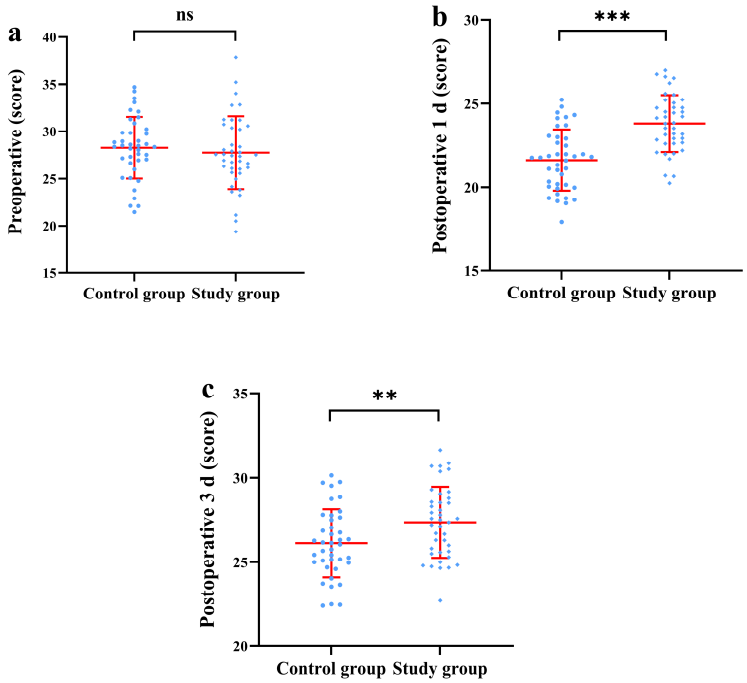

Fig. 4: MoCA score (a: preoperative MoCA score; b: postoperative MoCA score on 1 d; c: MoCA score at 3 d postoperatively; "ns", "***" and "**" represent no significant difference, $P<0.001$ and $P<0.05$, respectively).

pharmacological characteristics of remimazolam, which has mild inhibitory effects on circulation and respiration, have certain advantages over propofol used for non-intubated intravenous sedation (Masui, 2020), Both dexmedetomidine and remimazolam can effectively treat anxiety, but the combination of these two for surgery in patients with anxiety disorders under spinal anesthesia has not been reported yet. Gazal *et al*. (2016) analyzed that the combination of midazolam and ketamine for conscious sedation can maintain the sedative effect while reducing their side effects. The combination of the two has long been independently used to encourage pediatric patients to use sedative pain techniques. It has been proven that this combination works faster, has no pain, and is very proficient in amnesia, reducing the mandatory dose of ketamine and the occurrence of delusions/ delirium/hallucinations and ecstasy. Therefore, in this study, dexmedetomidine combined with remimazolam was used for surgery in patients with anxiety disorders under spinal anesthesia. The findings indicated that intraoperative sedation was effective and that the combined use of the two enhanced the sedative effect of each other, providing a good intraoperative sedative state. In patients with anxiety, the superiority of this combination of use lies in its ability to provide good sedative effects while reducing the need for anesthetic drugs, lowering the risks and complications associated with anesthesia and helping to maintain the patient's physiological stability (Paspatis *et al*., 2002).

The HR and MAP are important vital sign indicators (Wei *et al*., 2022) and the findings of this study demonstrated that the HR and MAP vital sign indicators were remarkably increased ($P<0.05$) and that the physiological status were more stable in the study group of anxiety patients under spinal anesthesia as compared to the control group, indicating that the patients of the study group of their stress response was better controlled. The Ramsay score can effectively reflect the sedation and anxiety status of patients (Gu *et al*., 2020), and the findings revealed that control group had higher Ramsey scores than the study group at the time of awakening and leaving the operating room ($P<0.05$), while the VAS score reflecting the degree of pain of patients showed no significant difference between the two groups at the time of awakening and leaving the operating room ($P>0.05$). At 6h after surgery, the VAS pain score of the study group was significantly lower than that of the control group ($P<0.05$). The HAMA, as a good indicator for evaluating anxiety disorders, showed that the HAMA scores were substantially below the control group in the study group at postoperative 1d and 3d ($P<0.001$). These results indicate that the combination of dexmedetomidine and remimazolam for spinal anesthesia is therapeutic in patients with anxiety disorders. Zeng *et al*. (2022) reached consistent conclusions in clinical trials using intranasal dexmedetomidine to treat preoperative anxieties and sleeplessness.

Surgical trauma, anesthesia, blood pressure changes, and other factors can all have an impact on patients' cognitive function, leading to cognitive impairment (Hassan *et al*., 2024). The MMSE scores and MoCA scores for study group showed significant superiority over the control

group. The findings of this study indicated that the MMSE scores and MoCA scores of the study group were remarkably better than in the control group on postoperative 1 d and 3 d, indicating that the combined use of dexmedetomidine and remimazolam anesthesia has a relatively mild impact on patients' cognitive function. Kang *et al*. (2022) reported similar conclusions in their experiment on the sedative effect of Remimazolam Besylate on elderly non general anesthesia patients. In serological indicator analysis, PAF is a bioactive phospholipid with strong platelet activation and vasoconstriction effects. Its release may cause a series of physiological reactions, such as elevated blood pressure and increased heart rate, IFN-γ is an important immune regulatory factor that has a regulatory effect on the body's immune function during anesthesia and surgery. Changes in its concentration can affect the body's immune function and postoperative recovery. This study found that compared with the control group, the PAF levels decreased and IFN-γ levels increased at postoperative 1 d in the study group, indicating that the serum indicators in the study group were more stable. The combination of dexmedetomidine and remimazolam helps maintain physiological stability and is of great significance for postoperative recovery. L. Li *et al*. (2024) reported consistent conclusions in their study on the anesthetic effect of remimazolam combined with benzimidazole sulfonate during hysteroscopic surgery and its impact on postoperative cognitive function in patients. In addition, the incidences of postoperative injections painful, inhibited respirations, nausea, vomiting, dizziness and other undesirable reactions were markedly less for the study group than for the control group. These results indicate that in a retrospective case-control study on intraoperative sedation quality and postoperative cognitive function, the combination of dexmedetomidine and remimazolam in spinal anesthesia is more effective in patients with anxiety disorders.

STUDY LIMITATIONS AND FUTURE RECOMMENDATIONS

This study has some limitations with regard to the narrow sample size and the narrow follow-up time. At the same time, this study is not applicable to patients with difficulty in spinal canal puncture, pain in positioning and poor local anesthesia effect. In the future, methods such as increasing the number of cases can be used to further investigate and analyze the actual optimal dosage of the combination of the two drugs, thereby improving treatment efficiency.

CONCLUSION

A retrospective case-control study on intraoperative sedation quality and postoperative cognitive function revealed that the combination of dexmedetomidine and remimazolam for spinal anesthesia has a significantly better therapeutic effect on anxiety patients than using remimazolam alone, which also provides some clinical justification for the associated spinal anesthesia to circumvent the risks associated with surgery in patients with anxiety disorders.

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