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Dezocine versus esketamine as postoperative analgesia in women undergoing cesarean section

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Abstract

The objective of this was to investigate the effect of esketamine as a postoperative analgesia in women undergoing caesarean section. A total of 134 patients were divided into two groups: 112 received esketamine and 22 received dezocine, based on their voluntary choice of analgesic drugs for patient-controlled intravenous analgesia (PCIA). The postoperative analgesic effects were compared between the two groups. The results showed that the visual analogue scale (VAS) scores at 12 and 24 hours post-operation were significantly lower in the esketamine group than in the dezocine group (P<0.05). Additionally, the time to first anal exhaust was earlier in the esketamine group (P<0.05), while there were no significant differences in the time to first ambulation or urination between the two groups (P>0.05). There was no significant difference in adverse reactions between the groups (P>0.05). The Edinburgh postnatal depression scale (EPDS) scores at 1 and 3 days after surgery were significantly higher than the preoperative scores in both groups (P<0.05); however, the EPDS scores were significantly lower in the esketamine group compared to the Dezocine group (P<0.05). We conclude that esketamine provides effective postoperative pain relief in women undergoing caesarean section patients without increasing adverse reactions, while it promotes recovery and reduces postpartum depression. *(Afr J Reprod Health 2025; 29 [1]: 127-133).*

Keywords: Esketamine; dezocine; cesarean section; patient controlled intravenous analgesia

Résumé

L'objectif était d'étudier l'effet de l'eskétamine comme analgésie postopératoire chez les femmes subissant une césarienne. Au total, 134 patients ont été divisés en deux groupes : 112 ont reçu de l'eskétamine et 22 ont reçu de la dézocine, sur la base de leur choix volontaire d'analgésiques pour l'analgésie intraveineuse contrôlée par le patient (PCIA). Les effets analgésiques postopératoires ont été comparés entre les deux groupes. Les résultats ont montré que les scores de l'échelle visuelle analogique (EVA) 12 et 24 heures après l'opération étaient significativement plus faibles dans le groupe eskétamine que dans le groupe dézocine (P < 0,05). De plus, le délai avant la première évacuation anale était plus précoce dans le groupe eskétamine (P < 0,05), alors qu'il n'y avait pas de différence significative dans le délai avant la première déambulation ou la première miction entre les deux groupes (P > 0,05). Il n'y avait pas de différence significative dans les effets indésirables entre les groupes (P > 0,05). Les scores de l'échelle de dépression postnatale d'Édimbourg (EPDS) à 1 et 3 jours après la chirurgie étaient significativement plus élevés que les scores préopératoires dans les deux groupes (P < 0,05) ; cependant, les scores EPDS étaient significativement inférieurs dans le groupe eskétamine par rapport au groupe Dezocine (P <0,05). Nous concluons que l'eskétamine procure un soulagement efficace de la douleur postopératoire chez les femmes subissant une césarienne sans augmenter les effets indésirables, tout en favorisant la récupération et en réduisant la dépression post-partum. *(Afr J Reprod Health 2025; 29 [1]: 127-133).*

Mots-clés: Eskétamine ; dézocine; césarienne; analgésie intraveineuse contrôlée par le patient.

Introduction

The postoperative pain experienced following a caesarean section primarily arises from nerve damage at the incision site and the discomfort associated with uterine contractions. Consequently, the need for analgesic intervention is greater in comparison to the general population[1]. Furthermore, the surgical procedure known as caesarean section has been found to elicit the release of inflammatory mediators within the body, consequently leading to the experience of heightened postoperative pain[2]. This postoperative pain has the potential to significantly impact the psychological well-being of the parturient. Notably, alterations in one's psychological state can influence their pain threshold, and the interplay between these factors can contribute to an increased likelihood of developing postpartum anxiety and depression[3-4]. Consequently, the amelioration of postoperative

pain holds a positive influence on the prevention of postpartum anxiety and depression.

In recent years, Emergency Recovery After Surgery (ERAS) has been continuously developed in obstetrics and gynecology. It refers to the use of a series of clinical interventions in the perioperative period to reduce patients' stress reaction, shorten the length of hospitalization, and promote early postoperative recovery[5-6]. patient controlled intravenous analgesia (PCIA) is one of the most effective ways to treat postoperative pain, which can significantly reduce the postoperative pain of patients.

There are various types of drugs available for patient-controlled intravenous analgesia (PCIA), with classical opioids still being the primary choice. However, these drugs stimulate μ2 receptors and can lead to numerous adverse reactions. This has prompted significant interest in the search for suitable alternative drugs. Esketamine is a dextral ketamine, which produces analgesic and sedative effects by blocking the combination of glutamic acid and N-methyl-D-aspartate (NMDA) receptor, and at the same time, it combines with opioid receptors in the dorsal horn of spinal cord and brain center to produce analgesic effects[7]. Esketamine has been widely used as an anti-anxiety, anti-depression and perioperative analgesia. There are many clinical studies on esketamine, but few reports on PCIA for cesarean section. Dezocine is an opioid analgesic that exerts its analgesic effects primarily by binding to the μ (mu) and κ (kappa) opioid receptors in the central nervous system. It acts as an agonist on the μ receptor and exhibits antagonist properties on the κ receptor, which gives it a unique effect in pain management. Dezocine is typically used for pain management after surgery or injury.

Therefore, we have chosen it as a control for our study. This study aims to observe the analgesic effect of esketamine in PCIA for cesarean section and evaluate its impact on postpartum depression.

Methods

This study was approved by the Ethics Committee of Affiliated Maternity and Child Health Care Hospital of Nantong University (Y2022035). All patients gave informed consent.

Patients

One hundred and thirty-four cases of cesarean section patients admitted to our hospital from 2021.09 to 2021.12 were chosen as the participants in this study. The patients were divided into esketamine (112 cases) and Dezocine (22 cases) groups according to the difference of voluntary choice of analgesic drugs for PCIA. The inclusion criteria were : 1. clear indications for caesarean section; 2. Grade I to Grade II classification for anaesthesia according to the American Society of Anesthesiologists (ASA); 3. no history of anesthesia allergy; 4. hiving normal cognitive, understanding, reading and writing abilities; 5. receiving subarachnoid anaesthesia during the operation, and PCIA after operation.

The exclusion criteria were: 1. anaesthestic contraindication; 2. history of allergy to anaesthesia; 3. psychiatric history; 4. previous use of antidepressants; 5. change of anaesthesia mode in the treatment process; 6. patients who are unable to communicate effectively. The general clinical data of patients are shown in the Table-1.

PCIA method

All the parturients received PCIA after operation for 48 h. The Dezocine groups were given Dezocine (Yangtze River Pharmaceutical Group Co., Ltd, China) 5 mg, Butorphanol tartrate (Shanghai Hengrui Pharmaceutical Co., Ltd, China) 8 mg, Granisetron (Shandong Luoxin Pharmaceutical Co., Ltd, China) 3 mg, added normal saline to 80ml. The Esketamine group received Esketamine (Jiangsu Hengrui Pharmaceutical Co., Ltd, China) 100 mg, Butorphanol tartrate (Shanghai Hengrui Pharmaceutical Co., Ltd, China) 8 mg, Granisetron (Shandong Luoxin Pharmaceutical Co., Ltd, China) 3 mg, added normal saline to 100 ml. Parameters of analgesia pump: Bonus dose2 ml, Background infusion 2 ml/h, Lockout time 30 min.

Evaluation indices

The visual analogue scale (VAS)[8] was used to assess pain ratings at 6, 12, 24, 48 h. The rehabilitation of patients was assessed with time of first ambulation, time of first urination and time of first anal exhaust.

Edinburgh postnatal depression scale (EPDS)[9] was used to evaluate the depression at before surgery and 1, 3, 5 d after operation. The adverse reactions were observed.

Statistical analysis

The data obtained in this study was analyzed using SPSS 21.0 statistical software. The measurement data conformed to the normal distribution which was confirmed with Shapiro-Wilk test, and were expressed by mean±SD, and Independent t-test was used to compare the two groups. The counting data obtained were expressed by constituent ratio, and Chi square test or Fisher exact test probability method were used for comparison between groups. $P<0.05$ considered the difference between the groups to be statistically significant.

Results

General clinical data of patients

There was no significant difference in general clinical data between the two groups ($P>0.05$). The results were showed in the Table-1.

Patient's VAS score

The VAS scores of the Esketamine group at 12 h and 24 h after operation were lower than those of the Dezocine group ($P<0.05$), and there was no significant difference between the two groups at 6 h and 48 h after operation ($P>0.05$). The results were showed in the Table-2.

Rehabilitation of patients

The time of first anal exhaust in Esketamine group was earlier than that in Dezocine group ($P<0.05$), and there was no significant difference between the two groups for time of first ambulation and time of first urination ($P>0.05$). The results were showed in the Table-3.

Adverse reactions

Adverse reactions mainly included nausea, vomiting and dizziness, there was no significant difference between the two groups ($P>0.05$). The results were showed in the Table-4.

Patient's EPDS score

There was no significant difference in EPDS score between the two groups before surgery ($P>0.05$). The EPDS score of the two groups at 1 and 3 d after operation was significantly higher than that before operation ($P<0.05$), and the elevation of Dezocine group was more obvious, while the EPDS score of Esketamine group was significantly lower than that of Dezocine group ($P<0.05$). The EPDS score of the two groups recovered to the preoperative level at 5 d after operation. The results were showed in the Table-5.

Discussion

Incision pain and uterine contraction following a caesarean section can result in intolerable acute pain[10]. Pain stimulation can restrict patients' activities and delay the recovery of gastrointestinal function.

At the same time, changes in hormone levels and shifts in family roles can induce restlessness, insomnia, anxiety and other negative emotions, and even lead to postpartum depression[11-12].

Therefore, perfect management of pain and emotion after caesarean section can increase the comfort of the parturient during the perioperative period and facilitate speedy recovery post-surgery[11-12]. PCIA is an effective method of postoperative analgesia for parturients, which has the advantages of rapid onset, convenient use, safety, and controllability. However, how to choose analgesic drugs is the key to the effectiveness of PCIA. At present, opioids are still mainly used for postoperative analgesia after cesarean section in China.

However, opioids have many side effects, and are prone to drug dependence and have no effect on improving the adverse emotions of parturient after surgery. Reducing the dosage of opioids, combining with other analgesics, improving the analgesic effect and promoting postoperative rehabilitation are the basic requirements of the development of modern anesthesiology, These also play a key role in accelerating rehabilitation. Therefore, it is of great clinical significance to explore the drug combination of PCIA for cesarean section parturient.

Table1: General clinical data of patients

	Dezocine	Esketamine	*t* or $\chi 2$ value	*P* value
n	22	112		
Age	28.86±3.94	30.00±3.84	1.26	0.21
Weight	76.64±18.43	72.62±10.28	1.44	0.15
Height	161.36±5.63	161.70±5.68	0.25	0.80
BMI	29.21±5.04	27.77±3.65	1.58	0.12
Gestation				0.86
1	9 (40.91)	54 (48.21)		
2	8 (36.36)	27 (24.11)		
3	2 (9.09)	15 (13.39)		
4	2 (9.09)	9 (8.04)		
5	1 (4.55)	3 (2.68)		
6	0 (0.00)	1 (0.89)		
7	0 (0.00)	2 (1.79)		
8	0 (0.00)	1 (0.89)		
Production				0.87
0	13 (59.09)	68 (60.71)		
1	9 (40.91)	42 (37.50)		
2	0 (0.00)	2 (1.79)		

Note: BMI: body mass index.

Table 2: Patient's VAS score

	VAS			
	6 h	12 h	24 h	48 h
Dezocine	0.55±0.51	2.77±1.07	2.86±0.64	2.09±0.61
Esketamine	0.43±0.50	1.49±0.74	2.51±0.76	2.00±0.60
***t* value**	1.00	6.90	2.05	0.65
***P* value**	0.32	<0.01	0.04	0.52

Table 3: Rehabilitation of patients

	time of first ambulation (h)	time of first urination (h)	time of first anal exhaust (h)
Dezocine	23.95±4.17	30.82±5.88	34.82±5.88
Esketamine	23.86±4.16	30.21±5.28	28.75±4.43
***t* value**	0.10	0.49	5.55
***P* value**	0.92	0.63	<0.01

Table 4: Adverse reactions

	nausea	vomiting	Dizziness
Dezocine	2 (9.09)	2 (9.09)	2 (9.09)
Esketamine	1 (0.89)	8 (7.14)	2 (1.79)
$\chi 2$ value	2.52	0.00	1.34
***P* value**	0.11	1.00	0.25

Table 5: Patient's EPDS score

	before surgery	1 d	3 d	5 d
Dezocine	3.09±0.61	9.68±3.33	9.36±3.19	3.09±0.97
Esketamine	2.97±0.65	8.23±2.95	5.28±1.86	2.99±1.07
***t* value**	0.78	2.06	8.24	0.41
***P* value**	0.44	0.04	<0.01	0.69

Note: EPDS: Edinburgh postnatal depression scale

Esketamine is a highly fat-soluble drug, which can quickly enter the brain through the blood brain barrier. It takes effect within 30 seconds after intravenous injection and 1 to 5 minutes after intramuscular injection. It has a fast elimination rate and is mainly metabolized in the liver. It has sedative and analgesic effects due to its effects on many receptors, including NMDA receptor, opioid receptor, monoamine receptor, sodium channel, calcium channel, etc[13-18]. In this study, the comparison of postoperative analgesia between Esketamine and Dezocine showed that, the VAS scores of the Esketamine group at 12 h and 24 h after operation were lower than those of the Dezocine group, and there was no significant difference between the two groups at 6 h and 48 h after operation. VAS score is a commonly used index to evaluate pain intensity. The higher the score, the greater the pain intensity, and our results indicated that Esketamine effectively relieved the pain of parturient after cesarean section and had better postoperative analgesia effect. There was no significant difference in the analgesic effect between the two groups 6 hours after operation, which may be related to the incomplete regression of the effect of intraspinal block. The pain intensity was significantly reduced 48 hours after operation, leading to no significant difference in the analgesic effect between the two groups.

Opioids can bind with opioid receptors in the brain and spinal cord, inhibit urination reflex, and inhibit gastrointestinal smooth muscle movement, thus prolonging the time of first urination and exhaust[19]. Our results showed the time of first anal exhaust in Esketamine group was earlier than that in Dezocine group, which indicated that Esketamine promoted the rehabilitation of patients, however, there was no significant difference between the two groups for time of first ambulation and time of first urination, which may be related to the statistical deviation caused by the small number of samples in Dezocine group. This requires further verification with large-scale sample research to be conducted by us later. In this study, adverse reactions mainly included nausea, vomiting and dizziness, and there was no significant difference between the two groups, which indicated that Esketamine did not increase the adverse reactions.

Postpartum depression (PPD) is a common psychosocial disease, which will adversely affect the quality of life of mothers, newborns and families[20]. Researches show that the incidence rate of PPD in China is 1.0%~52.1%[21, 22]. Compared with any other time in the life of adult women, severe depression is more likely to occur after delivery[23]. Some scholars pointed out that[24-25], anxiety and depression may not only aggravate the patients' postoperative pain and stress reaction, affect the postoperative recovery, and potentially lead to postpartum psychosis in severe cases, but also have adverse effects on the healthy development of the baby, hinder the mother-baby relationship. In extreme cases, it can even result in maternal suicide and infanticide.

Therefore, the adverse emotions such as anxiety and depression of the parturient after operation should not be ignored. Our results showed the EPDS score of the two groups at 1 and 3 d after operation was significantly higher than that before operation, and the elevation of Dezocine group was more obvious, while the EPDS score of Esketamine group was significantly lower than that of Dezocine group, which indicated that Esketamine improve the PPD. Its antidepressant mechanism may be related to the effect of Esketamine on antagonizing NMDA receptor[26].

Study strengths and limitations

Our results indicate esketamine provides effective relief from postoperative pain in women who have had a cesarean section, while not increasing the risk of adverse reactions. It aids in their recovery and contributes to alleviating postpartum depression. It is worth promoting and applying in clinical practice. However, this study is a single-center study with a relatively small sample size, particularly in the Dezocine group where the sample size is even smaller. We will further expand the sample size for validation in future research

Conclusion

Esketamine effectively relieves postoperative pain in women who have undergone a cesarean section without increasing adverse reactions. It promotes their recovery and helps improve postpartum depression

Conflict of interests

The authors declare that they have no conflict of interest.

Funding

None.

Ethics approval

This study was approved by the Ethics Committee of Affiliated Maternity and Child Health Care Hospital of Nantong University (Y2022035).

Consent to participate

All patients had given informed consent.

Consent for publication

All patients had given informed consent.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Author contributions

WQ, XZ conceived and designed the experiments. WQ, XZ performed experiments and analyzed the data. WQ wrote the paper. All authors reviewed the manuscript

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