General anesthesia combined with epidural anesthesia on the postoperative cognitive functions in pregnant women with dystocia

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Abstract. Effects of general anesthesia combined with epidural anesthesia on the postoperative cognitive functions in pregnant women with dystocia were investigated. Postoperative cognitive functions of 84 dystocia pregnant women treated with cesarean section were retrospectively analyzed. Patients who received general anesthesia were included in group A (n=42), and those who received general anesthesia combined with epidural anesthesia were included in group B (n=42). Mean arterial pressure (MAP), heart rate (HR) and bispectral index (BIS) at different time-points after anesthesia in the two groups of patients were observed and compared. Recovery of anesthesia such as the recovery time of spontaneous breathing, recovery time of orientation and time of eye opening were observed and compared between two groups of patients. Mini mental state examination (MMSE) scores were obtained and compared between the the groups of patients at different time-points after operation. Three vital signs (MAP, HR and BIS) were not significantly different between group A and B at the same time-point (P>0.05) and the maintenance of anesthesia was satisfactory. Compared with group A, postoperative recovery time of spontaneous breathing, recovery time of orientation and the time of eye opening in group B were all significantly shorter (P<0.05). In addition, MMSE scores of patients in group B, 2 and 12 h after operation were 24.33±1.61 and 26.41±1.83 points, respectively, which were significantly improved compared with those of patients in group A (20.45±1.58 and 22.39±1.72 points, respectively) (P<0.05). In conclusion, recovery of postoperative cognitive functions in pregnant women with dystocia who received general anesthesia combined with epidural anesthesia was shorter to that of those who only received general anesthesia.

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Introduction

Dystocia refers to the unsuccessful delivery of the fetus caused by the force of labor, birth canal, fetus psychology, maternal psychology or the incoordination (1,2). Dystocia of cephalic presentation has become the most common dystocia mode in recent years, and accounts for ~90% of dystocia, and the incidence rate is ~12% (3,4). Without timely treatment, this disease will exert great influences on fetus and maternal outcomes, such as maternal systemic failure and fetal death. Mortality rate of dystocia fetuses during the perinatal period is much higher compared with that in normal pregnancy (5,6).

Thereby, cesarean section is a necessary means to improve the outcomes of dystocia pregnant women and fetuses. Anesthesia is a very important process during operation (7,8). Changes of cognitive functions such as cognitive ability and social competence are the main adverse effects after anesthesia operation. Although those disorders are reversible, life quality of patients will be inevitably affected (9,10). Combined anesthesia is to use two or more anesthetic drugs or anesthesia techniques successively or simultaneously to achieve better intraoperative and postoperative analgesia and satisfactory surgical conditions (11). Advantages of combined epidural anesthesia with general anesthesia include improved outcomes, high safety, elimination of fear and tension, and reduced adverse reactions, reduced use of general anesthesia during surgery, rapid recovery, reduced use of muscle relaxants and catheter retention for postoperative analgesia (12).

Therefore, effects of general anesthesia combined with epidural anesthesia on the postoperative cognitive ability of pregnant women with dystocia were investigated in this study to find an anesthesia method which has little influence on the cognitive ability of patients, which is of great significance to improve the safety and satisfaction of clinical surgical treatment.

Patients and methods

Subjects. Medical records of 84 pregnant women with dystocia treated with cesarean section in Yidu Central Hospital of Weifang from May 2014 to May 2016 were retrospectively analyzed. The study was approved by the Ethics Committee

of Yidu Central Hospital of Weifang (Shandong, China), and written informed consent was obtained from all patients. Pregnant women treated with general anesthesia were included in group A (n=42), and those who received general anesthesia combined with epidural anesthesia were classified into group B (n=42). There were 21 primiparas and 21 multiparas with a mean age of 33.2±12.3 years in group A and 19 primiparas and 23 multiparas with a mean age of 38.1±11.6 years in group B. All included patients were with a gestational age >28 weeks and all underwent singleton pregnancies. No heart, liver, other major organ diseases or pregnancy-induced hypertension syndrome was observed. Multiparas who received a second cesarean section were excluded, and pregnant women with chronic central diseases were not included.

Therapeutic methods. Patients in group A received general anesthesia and patients in group B were treated with general anesthesia combined with epidural anesthesia.

General anesthesia: before anesthesia induction, respirator (oxygen flow rate: 6 l/min) was used and the blood oxygen saturation was between 95-98%. Intravenous transfusion channel was established for intravenous injection of 0.025 mg/kg midazolam, 2.5 ng/ml remifentanil and 2.0 μg/ml propofol. A total of 3.0 μg/ml propofol and 2.5 ng/ml remifentanil were given to maintain anesthesia. Blood oxygen saturation was kept over 95% to maintain stable vital signs.

Epidural anesthesia: intervertebral puncture was performed between L2-L3. A total of 5 ml of 2% lidocaine was administered intermittently and routinely.

Observation indexes. Mean arterial pressure (MAP), heart rate (HR), bispectral index (BIS) in the two groups of pregnant women were recorded before operation (T1), at the beginning of cesarean section (T2), after taking out the fetus (T3) and at the end of the operation (T4). Recovery time of spontaneous breathing, recovery time of orientation and time of eye opening were also recorded in two groups of pregnant women. Mini mental state examination (MMSE) scores of pregnant women in the two groups at 2, 12 and 24 h were recorded.

Statistical analysis. Statistical Product and Service Solutions (SPSS) 19.0 software [AsiaAnalytics (formerly SPSS China), Shanghai, China] was applied for the statistical analysis. The comparisons of sex and effect of treatment were determined through χ^2 test; measurement data were expressed as mean ± standard deviation, and non-parametric K-S test was used for the comparison between two groups. ANOVA was used for comparison between multigroups and the post hoc test was LSD test. P<0.05 was considered to indicate a statistically significant difference.

Results

Clinical data. There were no significant differences in proportions of primipara and multipara between the groups (P>0.05). Both groups also had similar age (P>0.05). Dystocia of cephalic presentation was the dominant type in dystocia pregnant women of two groups, and accounts for >80% of the cases. A total of 90% of fetuses were at the mature gestational age. There was no difference in the residence ratio between two groups of patients, but compared with dystocia pregnant women from urban area, those from rural area accounted for a significantly higher ratio (P<0.05). Dystocia of the two groups of patients were related to many factors including force of labor, birth canal, psychology of fetus and pregnant women (Table I).

Table I. Comparison of basic data between the two groups of patients.

Basic data	Group A	Group B	P-value
n	42	4	
Primipara (n, %)	21 (50.00)	19 (45.24)	0.764
Multipara (n, %)	21 (50.00)	23 (54.76)	
Age (years)	33.2±12.3	38.1±11.6	0.812
Dystocia mode (n, %)			0.746
Dystocia of cephalic presentation	37 (88.10)	39 (92.86)	
Shoulder dystocia	1 (2.38)	0 (0.00)	
Breech presentation dystocia	4 (9.52)	3 (7.14)	
Others	0 (0.00)	0 (0.00)	
Gestational age (n, %)			0.865
≥37 weeks	4 (9.52)	2 (4.76)	
<37 weeks	38 (90.48)	40 (95.24)	
Residence (n, %)			0.381
Urban area	14 (33.33)	18 (42.86)	
Rural area	28 (66.67)	24 (57.14)	
Dystocia reason (n, %)			0.726
Single	11 (26.19)	9 (21.43)	
Multiple	31 (73.81)	33 (78.57)	

Analysis of preoperative and postoperative vital signs in 84 pregnant women. No significant differences in vital signs (MAP, HR and BIS) were found between group A and B at the same time-point (P>0.05). No differences in the MAP and HR were found among the four time-points in the groups (P>0.05), and the vital signs of patients were normal. BIS in patients at T2 and T3 were lower than that at T1 and T4 in both groups of patients (P<0.05) and the anesthesia maintenance was good during operation. There was no difference in the SpO2 between group A and group B at T1 and T2 (P>0.05), but significant differences were found between 2 groups at T3 and T4 (P<0.05). The SpO2 at T3 and T4 in group A was lower than that at T1 (P<0.05) (Table II).

Postoperative recovery of consciousness in 84 pregnant women. Compared with pregnant women in group A, postoperative spontaneous recovery time of pregnant women group B was significantly shorter (P<0.05). There was also a significant difference in the recovery time of orientation between group B (17.65±5.14 min and group A 23.07±3.31 min) (P<0.05). Pregnant women in group B had a relatively clear awareness of surroundings and themselves. There was a significant difference in time of opening eyes between two groups of pregnant women, and patients in group B woke up earlier (P<0.05). Postoperative recovery of

Table II. Comparison of the vital signs in 84 pregnant women at four time-points.

Vital signs		Group A	Group B	P-value
MAP (mmHg)	T1	87.24±9.42	86.73±10.01	0.931
	T2	77.21±11.36	75.32±10.39	0.925
	T3	85.22±8.99	87.12±9.33	0.928
	T4	84.39±9.26	83.64±9.77	0.974
HR (times/min)	T1	72.39±6.21	74.16±7.36	0.897
	T2	62.01±5.33	60.89±5.64	0.886
	T3	78.69±7.21	76.39±6.58	0.898
	T4	88.34±3.15	87.53±4.17	0.946
BIS	T1	93.57±1.56	94.33±1.24	0.952
	T2	54.71±7.02[a,b]	53.69±6.73[a,b]	0.925
	T3	59.48±4.32[a,b]	58.21±5.36[a,b]	0.963
	T4	87.01±8.47	89.36±9.12	0.972
SpO2 (%)	T1	99.5±0.2	99.4±0.2	0.995
	T2	97.4±1.2	98.7±1.6	0.769
	T3	93.5±2.1[c]	97.8±1.8	0.048
	T4	92.6±2.5[c]	97.2±3.1	0.035

[a]P<0.05, compared with T1; [b]P<0.05, compared with T4; [c]P<0.05, compared with T1. MAP, mean arterial pressure; HR, heart rate; BIS, bispectral index.

Table III. Postoperative recovery in the two groups of pregnant women (min).

Postoperative recovery	Group A	Group B	P-value
Recovery time of spontaneous breathing	17.19±2.41	14.83±3.09	0.034
Recovery time of orientation	22.58±3.46	17.36±4.62	0.028
Time of opening eyes	18.33±3.47	14.26±3.12	0.031

Table IV. Analysis of MMSE scores in the two groups of pregnant women.

MMSE scores	Group A	Group B	P-value
Before operation	27.68±1.72	28.36±1.94	0.879
2 h	20.45±1.58	24.33±1.61	0.036
12 h	22.39±1.72	26.41±1.83	0.032
24 h	27.14±1.98	27.41±2.01	0.997

MMSE, mini mental state examination.

consciousness in pregnant women in group B was significantly faster than that of pregnant women in group A (Table III).

MMSE scores in 84 pregnant women before and after operation. No significant difference in preoperative MMSE scores were found between two groups (P>0.05), but MMSE scores at 2 h after operation were significantly lower in group A (20.45±1.58) than those in group B (24.33±1.61) (P<0.05). MMSE scores at 12 h after operation in patients of group A were also significantly different from those in group B (P<0.05). At 24 h after operation, no significant differences in MMSE scores of pregnant women were found between two groups (P>0.05). No cognitive impairment was found in any of the patients (Table IV).

Discussion

In order to save the life of patients and reduce surgical stimulation, narcotic drugs and anesthetic means are inevitably used (13,14). However, the influences of anesthetics on neurological functions such as cognitive impairment of patients treated with operation have been reported in recent years (15). Studies have shown that anesthetics can produce neurotoxic effects on animals and affect their neurological functions (16,17). Therefore, it is necessary to find a safer anesthetic means to reduce those adverse effects, for patients who need surgical operations, especially for pregnant women who need cesarean section, because both pregnant women and fetuses are affected.

In this study, the postoperative recovery of cognitive functions of 84 pregnant women with dystocia who received cesarean section in Yidu Central Hospital were retrospectively analyzed and effects of general anesthesia combined with epidural anesthesia on cognitive functions of the pregnant women was explored. All pregnant women in this study were undergoing singleton pregnancies. Vital signs of the pregnant women during cesarean section were maintained well. MAP and HR were maintained within normal range, no bleeding and other unexpected conditions occurred during perioperative period, and the anesthesia was maintained well and no anesthesia revival happened during perioperative period. However, fluctuation of SpO2 in patients undergoing general anesthesia during surgery was more obvious than that of patients receiving general anesthesia combined with epidural anesthesia. Therefore, we speculated that general anesthesia combined with epidural anesthesia is more conducive to stabilization of patients' hemodynamics. A previous study (18) also reported that general anesthesia combined with epidural anesthesia stabilized hemodynamics in patients undergoing ovarian surgery. In this study we observed that patients who received general anesthesia combined with epidural anesthesia had a much shorter recovery time of spontaneous breathing than those only received general anesthesia alone. Wake-up time of pregnant women who received general anesthesia combined with epidural anesthesia was also shortened and faster awareness of the surrounding environment and themselves was achieved. Millar *et al* (19) also confirmed that general anesthesia has certain effects on reaction and mental movement of patients within 24 h, these effects recovered within 24 h and only a few patients showed obstacles to language and visual memory. Consciousness dysfunction was not observed, possibly due to the study subjects. Liu *et al* (20) showed that inhalation of sevoflurane can promote the development of amnestic cognitive impairment. Zywiel *et al* (21) mentioned that compared with local anesthesia, general anesthesia may increase the

risk of cognitive impairment at the early stage after operation. Reducing the use of morphine and oral administration of narcotic drugs may reduce the risk of postoperative cognitive impairment. Wang *et al* (22) confirmed that the application of general anesthesia combined with epidural anesthesia can effectively stabilize the hemodynamics of patients. This is consistent with our results. Moreover, Shi *et al* (23) also proved that the risk of cognitive impairment in patients receiving epidural anesthesia is lower than those receiving general anesthesia

In conclusion, postoperative recovery of cognitive functions in dystocia pregnant women treated with general anesthesia combined with epidural anesthesia is shorter than in those who received general anesthesia alone.

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Availability of data and materials

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

Authors' contributions

MF wrote the manuscript. MF and DL were responsible for recording and analysis of observation indexes. Both authors read and approved the final study.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Yidu Central Hospital of Weifang (Shandong, China). Signed written informed consents were obtained from the patients or the guardians.

Patient consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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