



Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

Effect of epidural anesthesia in labor; pregnancy with cardiovascular disease

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ARTICLE INFO

Article history:

Accepted 5 January 2018

Keywords:

Epidural anesthesia
Pregnancy
Cardiovascular disease
Cardiovascular events

ABSTRACT

Objective: We studied the effect and safety of epidural anesthesia during labor in pregnant women with cardiovascular disease.**Materials and methods:** In the pregnant women with cardiovascular disease, we compared maternal outcome and suppressive effect on blood pressure retrospectively between the epidural group (anesthetized epidurally during labor) and the no-epidural group (not anesthetized epidurally during labor). **Results:** A total of 277 patients were included in the analyses. Cardiovascular events decreased significantly in epidural group ($P < 0.05$). Cardiovascular events occurred in 12 (epidural group) and 2 (no-epidural group) of cases ($P < 0.05$). Cardiovascular events are all events related to arrhythmia. In the epidural group, the systolic blood pressure showed no increase in labor (110.5 mmHg, 95% CI; 95–132 mmHg vs. 110 mmHg, 95% CI; 91–130 mmHg). In the no-epidural group, the systolic blood pressure increased in labor (107.1 mmHg, 95% CI; 96–138 mmHg vs. 123 mmHg, 95% CI; 105–153 mmHg; $P < 0.05$).**Conclusion:** Epidural anesthesia had decrease of the cardiovascular events related to arrhythmia and the effect of significantly suppression raising the blood pressure during labor in pregnant women with cardiovascular disease. In pregnant women with the cardiovascular disease, epidural anesthesia during labor may be available.© 2018 Taiwan Association of Obstetrics & Gynecology. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Hemodynamic status in labor fluctuates greatly depending on uterus contraction, pain for uterus contraction. Therefore, pregnant women with cardiovascular disease may need epidural anesthesia during labor, depending on the seriousness and type of cardiovascular disease they suffer from.

When the uterus contracts, the venous return increases by 300–500 ml and the cardiac output increases [1]. The sympathetic nerve becomes activated by the pain of the uterine contraction, and arteriolar vasoconstriction occurs so that endogenous catecholamines are secreted. The blood pressure increases due to these changes. Moreover, the increase in the venous return and the activation of the sympathetic nerve can easily cause arrhythmia. These changes continue repeatedly for several hours during labor.

Epidural anesthesia decreases the pain of the uterine contraction, controls the blood pressure increase. Additionally, the peripheral vessels are enhanced by the sympathetic blockade, and the cause of arrhythmia is reduced. Additionally, the sympathetic blockade causes peripheral vasodilation [2–4]. The indications are not still clear, although epidural anesthesia decreases the maternal risk during labor according to the kind of cardiovascular disease.

The indications for epidural analgesia in pregnant women with cardiovascular disease are given in the American College of Cardiology (ACC)/American Heart Association (AHA) 2008 Guidelines [5], the European Society of Cardiology (ESC) Guidelines on the management of cardiovascular diseases during pregnancy [6], and the Guidelines for Indication and Management of Pregnancy and Delivery in Women with Heart Disease (Japanese Circulation Society; JCS 2010) [7]. However, these guidelines contain fairly vague history of the development of these indications. In the JCS guidelines, the indications of epidural anesthesia in pregnant women with cardiovascular disease include the following: Tachyarrhythmia, ischemic heart disease, regurgitant valvular disease, and

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mitral stenosis are classified as “reasonable indications,” and aortic stenosis, obstructive hypertrophic cardiomyopathy, Eisenmenger's syndrome, and post-mechanical valve replacement status are considered “relative contraindications.”

Pregnancy in association with high-risk cardiovascular disease has been increasing with the increase in late-in-life pregnancies and the progress in the development of fertility treatments. Therefore, we believe that the indications of epidural anesthesia in pregnant women with cardiovascular disease should be clarified for the purpose of ensuring safe delivery. We managed about 1600 pregnancies with cardiovascular disease between 1995 and 2013 in the Department of Perinatology [8–10], National Cardiovascular Center, Japan. Epidural anesthesia was administered to 30% of these patients. While the indications of epidural analgesia during labor in pregnant women with cardiovascular disease should be outlined, the effect and safety of epidural anesthesia in labor should be demonstrated before the indications are provided. Thus, we studied the effect and safety of epidural anesthesia during labor in pregnant women with cardiovascular disease.

Materials and methods

We studied pregnancies with cardiovascular disease between 2008 and 2012 at the Department of Perinatology, National Cardiovascular Center, Japan. In the pregnant women with cardiovascular disease, we compared retrospectively the epidural group (anesthetized epidurally during labor) with the no-epidural group (not anesthetized epidurally during labor). Pregnancies in which delivery was made by elective cesarean section and preterm birth were excluded.

Information on maternal background was collected including age, gestational age, parity, cardiovascular disease. Cardiovascular disease was categorized into congenital heart disease, arrhythmia, valvular disease, aortic disease, cardiomyopathy, ischemic disease, and others.

Maternal outcomes were examined including vaginal delivery rate, cardiovascular disease, duration of labor, blood loss associated with delivery, mechanical delivery, and augmentation of labor. Neonatal outcomes were examined including Apgar score at 5 min and pH of umbilical artery (UA pH).

In both groups, systolic blood pressure before labor and maximum systolic blood pressure during labor were examined. We contrasted the systolic blood pressure measured before labor with that measured during labor.

In the epidural group, complications associated with anesthetizing epidurally during labor were examined.

Univariate analysis was performed using the chi-squared test, and the Mann–Whitney U test and paired t-test were used for the statistical analysis. P-values <0.05 were considered significant.

Indication of epidural anesthesia in the study

The indications of epidural anesthesia in the study are shown in Table 1. Group A was not allowed to deliver without epidural anesthesia during labor. The cardiovascular diseases present in Group A include connective tissue disease, ectasia of the ascending aorta, cardiac hypofunction, unrepaired or palliated cyanotic congenital heart disease, uncorrected coarctation of the aorta, and cardiac failure. In Group B, epidural anesthesia was adopted aggressively during labor. However, when patients in Group B chose not to receive epidural anesthesia during labor, vaginal delivery without epidural analgesia was allowed. The cardiovascular diseases occurring in Group B were tachyarrhythmia; ischemic heart disease; mitral, aortic, tricuspid or pulmonary valve stenosis

Table 1

Cardiovascular disease; Indication for epidural analgesia in labor (Our institution criteria).

Group A: Patient should absolutely be given an epidural analgesia
1. Connective tissue disease (Marfan syndrome etc.)
2. Ectasia of the ascending aorta (≥ 35 mm)
3. Cardiac hypofunction (ejection fraction < 40%)
4. Unrepaired or palliated cyanotic congenital heart disease
5. Uncorrected coarctation of the aorta
6. Cardiac failure
Group B: Patient should be given an epidural analgesia
1. Tachyarrhythmia
2. Ischemic heart disease
3. Mitral, aortic, tricuspid or pulmonary valve stenosis and regurgitation
4. Unrepaired autistic spectrum disorder and ventricular septal defect
5. Cardiomyopathy
Group C: Follow a patient's wishes
Other disease

and regurgitation; unrepaired autistic spectrum disorder; ventricular septal defect; and cardiomyopathy.

Method of epidural anesthesia in labor

Lactated Ringer's solution (500 ml) was infused at the start of labor. Tubing epidurally is started at the end of infusion solution, and 1% lidocaine (3 ml) was administered in the epidural space. The part of puncture is collected between third lumbar spine and fourth lumbar spine. When patients showed no ill effects after the administration of 1% lidocaine, continuous dosing was started into the epidural space. The drug solution used in continuous dosing was 0.1% ropivacaine (50 ml) plus fentanyl 2 μ g.

The drug administration was performed at the rate of 6–8 ml/1 h. The patient's blood pressure was checked at 5-min intervals during labor. Epidural anesthesia was stopped at 2 h after delivery.

Results

We examined the pregnancy outcomes with cardiovascular disease in 416 pregnancies between 2008 and 2012 at the Department of Perinatology, National Cerebral and Cardiovascular Center, Japan. A total of 136 women, who delivered selectively by cesarean section due to obstetric or cardiovascular indications, and delivered preterm were excluded. Pulmonary hypertension, mechanical valve replacement, Eisenmenger syndrome was selected caesarean section. Maternal background data are shown in Table 2

Table 2

Background in the study. No significant differences in maternal background were found between epidural group and non epidural group.

	Epidural group (n = 128)	Non epidural group (n = 149)
Age (yr.)	32.3 \pm 5.2	32.0 \pm 5.0
Gestational weeks (week)	38.4 \pm 3.8	38.2 \pm 3.3
Birth weight (g)	2914.3 \pm 412.1	2844.2 \pm 509.1
Primipara	64 (48%)	72 (48%)
Cardiovascular disease		
Congenital heart disease	53 (42%)	56 (37%)
Arrhythmia	41 (33%)	51 (34%)
Valve disease	14 (11%)	16 (11%)
Aortic disease	8 (6%)	5 (3%)
Cardio myopathy	7 (5%)	7 (5%)
Ischemic disease	3 (2%)	7 (5%)
Other	2 (1%)	7 (5%)
Indication for epidural analgesia in labor		
Group A	16 (12%)	0 (0%)
Group B	51 (40%)	10 (7%)
Group C	61 (48%)	139 (93%)
Apgar score (5 min)	8.5 \pm 0.7	8.4 \pm 0.8
pH of UA	7.34 \pm 0.26	7.31 \pm 0.07

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