Impact of morbid obesity on epidural anesthesia complications in labor

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OBJECTIVE: We sought to determine whether morbid obesity is associated with increased maternal hypotension or fetal heart rate (FHR) abnormalities after epidural anesthesia placement during labor.

STUDY DESIGN: This was a retrospective cohort study of women undergoing epidural anesthesia during labor at term from April 2008 through July 2010.

RESULTS: A total of 125 morbidly obese patients were matched for age and race with 125 normal-weight patients. Morbidly obese patients had more frequent persistent systolic (16% vs 4%, $P = .003$) and diastolic (49% vs 29%, $P = .002$) hypotension and more prolonged (16% vs 5%, $P = .006$) and late (26% vs 14%, $P = .03$) FHR decelerations. Increasing body mass index was associated with persistent systolic (odds ratio, 1.06; 95% confidence interval, 1.02–1.10) and diastolic (odds ratio, 1.04; 95% confidence interval, 1.01–1.06) hypotension after controlling for epidural bolus dose and hypertensive disorders.

CONCLUSION: Morbidly obese women have more hypotension and prolonged FHR decelerations following epidural anesthesia during labor at term.

Key words: complications, epidural, hypotension, morbid obesity, obstetric anesthesia

Cite this article as: Vricella LK, Louis JM, Mercer BM, et al. Impact of morbid obesity on epidural anesthesia complications in labor. Am J Obstet Gynecol 2011;205:370.e1-6.

Maternal hypotension is not uncommon with labor epidural anesthesia placement, complicating 5-17% of cases.[1,2] Pregnancy increases maternal dependence on sympathetic vascular tone to maintain venous return and uteroplacental perfusion.[3,4] Regional anesthesia-associated sympathectomy with resultant maternal hypotension decreases uteroplacental perfusion and is an important potential cause of intrapartum fetal heart rate (FHR) abnormalities and emergent cesarean delivery. Uncorrected maternal hypotension during regional anesthesia can cause decreased uteroplacental perfusion resulting in fetal and neonatal hypoxia and/or acidosis.[5] Published data have demonstrated that pregnancy and obesity both decrease local anesthetic requirements during epidural anesthesia and may result in increased cephalad spread of epidural block.[6-8] However, the association between maternal obesity and epidural-associated hypotension is unknown. Our objective is to determine whether morbid obesity is associated with increased maternal hypotension or FHR abnormalities after epidural anesthesia placement during labor.

★ EDITORS' CHOICE ★

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Received March 9, 2011; revised May 2, 2011; accepted June 22, 2011.

The authors report no conflict of interest.

Presented as a poster at the 31st Annual Meeting of the Society for Maternal-Fetal Medicine, San Francisco, CA, Feb. 7-12, 2011.

Reprints not available from the authors.

0002-9378/free

doi: 10.1016/j.ajog.2011.06.085

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Materials and Methods

In this retrospective cohort study, women who had undergone epidural anesthesia placement during labor from April 2008 through July 2010 at an academic tertiary care center were identified utilizing our computerized perinatal database. Women admitted for labor or induction who consented to epidural catheter placement and delivered at least 1 hour after epidural dosing were included. Women with multifetal deliveries, preterm deliveries, nonvertex presentations, major fetal anomalies, and those delivering within 1 hour of epidural dosing were all excluded.

A total of 125 morbidly obese women with body mass index (BMI) ≥ 40 kg/m^2 at delivery were matched for age and race to 125 normal-weight women with BMI ≤ 25 of kg/m^2 (World Health Organization criteria). Individual patient charts, anesthesia records, and electronic fetal monitor (EFM) tracings were reviewed by a single investigator (L.K.V.). Tracing interpretation was performed in a masked fashion. Baseline maternal characteristics, epidural catheter placement information, hemodynamic parameters, and delivery outcomes were compared between groups.

The primary outcome measure was the occurrence of maternal hypotension within 1 hour of epidural placement. The secondary outcome measure was the new onset of fetal heart tracing abnormalities within 1 hour of epidural placement.

During this time period, women routinely received a 500-mL bolus of intravenous crystalloid for volume expansion prior to the procedure. Following epidural catheter placement and administration of a test dose, a bolus dose of 2-8 mL of a bupivacaine 0.125%, fentanyl 7.5 μg/mL, and epinephrine 5 μg/mL solution was administered. If the initial dose did not achieve satisfactory analgesia

TABLE 1
Baseline characteristics by body mass index category

Characteristics	Normal weight n = 125	Morbidly obese n = 125	*P* value
Age, y	24 [21–31]	25 [21–32]	.6
Gestational age, wk	39 [38–40]	39 [38–40]	.6
Nulliparity, %	35	44	.2
Prior vaginal deliveries	1 [0–2]	1 [0–2]	.4
Race, %			
Black	50	58	.3
Hispanic	10	10	
White	40	32	
Insurance, %			
Public	84	84	.1
Private	16	16	.1
BMI, kg/m^2			
Pregravid	20 [18–21]	41 [39–46]	< .0001
Delivery	24 [23–25]	45 [42–49]	< .0001
ASA score, U	2 [2–2]	2 [2–2]	.4
Medical comorbidities, %			
Chronic hypertension	4	18	< .0001
Preeclampsia spectrum	10	20	.05
Diabetes, pregestational	0	5	.03
Diabetes, gestational	2	10	.006
Asthma	10	15	.3

ASA, American Society of Anesthesiologists; *BMI*, body mass index.
Data presented as percent or median [interquartile range].

Vricella. Morbid obesity and epidural anesthetic complication for labor. Am J Obstet Gynecol 2011.

then additional anesthetic boluses were administered. The amount of epidural anesthetic bolus administered and the decision to administer any additional boluses were determined by the attending anesthesiologist, as was the decision to administer intravenous pressor support. Phenylephrine was the only pressor agent used.

Baseline blood pressure was defined as the value recorded immediately prior to epidural catheter placement. Blood pressures were assessed in the supine position with a tilt. The lowest systolic and diastolic blood pressures recorded in 10-minute intervals for the first 30 minutes and at 15-minute intervals for the next 30 minutes were compared with baseline values. An optimal standard definition for obstetric anesthesia-related hypotension has not been established.[9] We defined systolic and diastolic hypotension as a 20% decrease in systolic and a 20% decrease in diastolic blood pressure, respectively.[10] Although hypotension has been commonly defined by the systolic value in published studies, hypotension based on diastolic values is uncommonly evaluated. Because diastolic blood pressure maintains uteroplacental perfusion, diastolic hypotension could potentially have more clinical significance in this obstetric context and was therefore evaluated separately. Persistent hypotension was defined as at least a 20% decrease from baseline in 3 intervals during the first 60 minutes after epidural anesthetic bolus. We defined sustained hypotension as that occurring in all 5 measured intervals in the hour following epidural dosing. In an effort to be comprehensive we evaluated systolic and diastolic hypotension separately to determine which was more profoundly affected by epidural catheter dosing and which had a greater association with fetal heart tracing abnormalities.

FHR tracings (EFM) for 60 minutes before and after epidural anesthetic bolus were classified according to the 2008 National Institute of Child Health and Human Development (NICHD) EFM guidelines.[11] The preepidural and postepidural tracings were categorized as category I (normal), category II (indeterminate), or category III (abnormal) according to the published NICHD guidelines. Findings that were not present prior to epidural placement were considered new changes. New occurrence of decreased variability (minimal or absent), recurrent variable decelerations, recurrent late decelerations, and prolonged decelerations (>2 minutes) constituted "nonreassuring" tracings that would require an obstetric intervention. A nonreassuring tracing was defined as one that would require an obstetric intervention to either return to a category I tracing or necessitate delivery. Because prolonged and late decelerations are the anticipated tracing abnormalities with uteroplacental insufficiency after epidural-associated hypotension, these 2 findings were evaluated together as a composite variable.[12,13] The occurrence of tachysystole in association with late or prolonged decelerations was also recorded.

Statistical analysis

We note that a 5% incidence of hypotension has been found in the general population during epidural catheter placement for labor when intravenous preloading is performed.[1,14] A priori analysis demonstrated that to detect a 15% incidence of hypotension in morbidly obese women, at an alpha of 0.05 and a beta of 0.2, 100 women would be needed in each group. Statistical analyses were performed using commercially available software (SPSS, version 18.0; SPSS Inc, Chicago, IL). We evaluated differences between the groups using the Student *t* test for continuous variables, and the Mann-Whitney *U* test and Fisher's exact tests for categorical variables. We then