Combined spinal-epidural anesthesia for Cesarean section in a patient with peripartum dilated cardiomyopathy

[L'anesthésie rachidienne et péridurale combinée pour la césarienne chez une patiente souffrant de cardiomyopathie du péripartum]

Roman Shnaider MD, Tiberiu Ezri MD, Peter Szmuk MD, Stephen Larson DMD,
R. David Warters MD, Jeffrey Katz MD

Purpose: To report a case of peripartum dilated cardiomyopathy associated with morbid obesity and possible difficult airway presenting for elective Cesarean section, which was successfully managed with combined spinal-epidural anesthesia.

Clinical features: A morbidly obese parturient with a potentially difficult airway, suffering from idiopathic peripartum cardiomyopathy (ejection fraction 20%), was scheduled for an elective Cesarean section.

A combined spinal epidural anesthesia was performed and 6 mg of bupivacaine were injected into the subarachnoid space. This was supplemented after 60 min with 25 mg of bupivacaine injected epidurally. The patient's hemodynamic status was monitored with direct intra-arterial blood pressure and central venous pressure measurements. The patient's perioperative course was uneventful.

Conclusion: In patients suffering from peripartum cardiomyopathy, undergoing Cesarean section, combined spinal-epidural anesthesia may be an acceptable anesthetic alternative.

Objectif : Présenter un cas de cardiomyopathie du péripartum associée à de l'obésité morbide et à des difficultés d'intubation possibles chez une patiente qui a subi une césarienne réalisée avec succès sous anesthésie rachidienne et péridurale combinée.

Éléments cliniques : Une parturiente, présentant une obésité morbide et des difficultés d'intubation possibles, souffrait de cardiomyopathie idiopathique du péripartum (fraction d'éjection de 20 %) au moment de subir la césarienne prévue.

L'anesthésie rachidienne et péridurale combinée a été réalisée avec l'injection de 6 mg de bupivacaine dans l'espace sous-arachnoïdien, complétée après 60 min, par l'injection péridurale de 25 mg de bupivacaine. L'état hémodynamique de la patiente a été surveillé par

des mesures directes de la tension intra-artérielle et de la pression veineuse centrale. Aucun incident périopératoire n'a été observé.

Conclusion : L'anesthésie rachidienne et péridurale combinée peut être un choix acceptable à envisager dans le cas de patientes atteintes de cardiomyopathie du péripartum qui subissent une césarienne.

PERIPARTUM cardiomyopathy occurs in approximately 1/10,000 deliveries¹ and can result in severe ventricular dysfunction during late pregnancy or early puerperium.²

We present a patient with peripartum cardiomyopathy requiring Cesarean section (CS) who was managed with combined spinal-epidural (CSE) anesthesia.

Case report

A 25-yr-old, morbidly obese (weight 100 kg, height 1.58 m and body mass index 40) primigravida at 36 weeks gestation, with a Mallampati class IV airway, was scheduled for an elective CS. Two weeks before, she had complained of progressively worsening fatigue and dyspnea with minimal physical activity. A cardiology consultation obtained to evaluate progressively worsening fatigue led to the diagnosis of idiopathic dilated cardiomyopathy. Echocardiography revealed severe left ventricular dysfunction ejection fraction (EF) 20% with moderate pulmonary hypertension and moderate right ventricular dysfunction. Treatment with furosemide, digoxin, and potassium supplemen-

From the Department of Anesthesiology University of Texas Medical School at Houston, Houston, Texas, USA.

Address correspondence to: Dr. Peter Szmuk, Assistant Professor, The University of Texas-Houston Medical School, Department of Anesthesiology, 6431 Fannin, MSB 5.020 Houston, Texas 77030, USA. Phone: 713-500-6184; Fax: 713-500-6201; E-mail: Peter.Szmuk@uth.tmc.edu

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tation was started and continued for ten days, and delivery via CS was planned.

On arrival in the operating room, the patient was eupneic and was free of peripheral edema. Chest sounds were clear. Frequent ($5\cdot\text{min}^{-1}$) ventricular premature beats were present on the electrocardiogram despite a normal potassium blood level and a serum digoxin level within the therapeutic range. The coagulation profile was normal. The patient's baseline blood pressure and heart rate were 102/70 mmHg (MAP 90) and 95 $\text{beats}\cdot\text{min}^{-1}$ respectively (Table).

A triple-lumen catheter and an arterial cannula were inserted under local anesthesia into the right internal jugular vein and right radial artery respectively. Five hundred milliliters of lactated Ringer's solution were infused over 15 min to increase the central venous pressure (CVP) from 10 to 15 mmHg.

A CSE was performed at the L3–L4 interspace in the sitting position. Six milligrams of hyperbaric bupivacaine (0.8 mL of 0.75%) together with 15 μg of fentanyl were injected over 20 sec through a 27G, 120 mm Sprotte needle into the cerebrospinal fluid. No local anesthetic was given through the epidural catheter at this stage. A wedge was placed under the right hip to minimize aorto-caval compression. The upper levels of sensory block obtained were T8 at three minutes, T6 at five minutes and T5 at ten minutes. The operation proceeded uneventfully and a healthy baby was delivered eight minutes later (Apgar score 9/10 and umbilical cord pH 7.30). Supplementation of the subarachnoid block was necessary with bupivacaine 5 mL of 0.5% and 0.25% at 60 and 105 min respectively. The patient remained stable hemodynamically throughout the procedure. A total of 1300 mL of lactated Ringer's solution was administered (including the 500 mL which were administered before anesthesia). Echocardiography performed a week after delivery revealed an EF of 50%.

Discussion

Although the etiology of peripartum cardiomyopathy is uncertain, viral, autoimmune and idiopathic causes have been considered.³ Cardiomyopathy is usually a diagnosis of exclusion. Common misdiagnoses include other types of cardiomyopathy, valvulopathies, accelerated hypertension, diastolic ventricular dysfunction, systemic infection, pulmonary embolism, etc.⁴ There is an increased incidence with multiple gestation, preeclampsia, obesity, advanced maternal age,¹ African descent and prolonged tocolysis.⁴ Treatment includes digitalis, diuretics, vasodilators, and anticoagulants.⁴ If supportive treatment fails, cardiac transplantation may be indicated.⁵ The prognosis is related to the recovery

TABLE Hemodynamic parameters during surgery

	Mean arterial pressure (mmHg)	Heart rate ($\text{beats}\cdot\text{min}^{-1}$)	Central venous pressure (mmHg)
Preoperative	90	95	10
Postspinal	85	95	15
Post delivery	80	90	8
60 min from start	90	92	14
End of surgery (85 min)	87	90	12

of ventricular function.⁴ The mortality rate of peripartum cardiomyopathy is 30–60% and may be caused by severe pulmonary congestion, and/or thromboembolic events.^{2,6} Survivors have a 50–80% risk of developing cardiac failure during future pregnancies, with an associated mortality rate of 60%.⁷ Cardiovascular status may benefit from prompt vaginal delivery or CS.¹

There is scant information in the literature regarding the anesthetic management of peripartum cardiomyopathy, although several anesthetic options for CS have been reported. Malinow presented two patients undergoing CS under spinal anesthesia and general anesthesia (GA) respectively.⁸ Both had full cardiac recovery within seven to eight days. Epidural lidocaine, titrated in small aliquots together with fentanyl, has been successfully employed in a patient with pulmonary hypertension and cardiomyopathy.⁹

GA may be necessary for urgent CS.⁶ However, performing a rapid sequence induction on a patient with compromised cardiac function can be very challenging. When time permits, a carefully administered regional anesthetic would seem to be advantageous. In addition to avoiding the stress of GA, the vasodilatation produced by regional anesthesia is beneficial with isolated left ventricular dysfunction.¹⁰

If time permits, hemodynamics should be optimized by careful fluid replacement under the control of invasive monitoring prior to surgery. We chose to monitor CVP rather than pulmonary capillary wedge pressure for assessing the cardiac filling pressures primarily because the patient was asymptomatic and hemodynamically stable despite the low EF. Successful outcome using only non-invasive monitoring has been reported.¹¹ Intraoperative monitoring with transesophageal echocardiography has been reported in obstetric patients with hypertrophic cardiomyopathy.¹²

We preferred CSE to epidural anesthesia (EA) for several reasons. First, CSE has a lower failure rate than EA.¹³ Secondly, intra-operative patient satisfaction,

anxiolysis, and post-operative pain scores have been superior with CSE.¹⁴ Furthermore, some authors report a lower incidence of hypotensive episodes with CSE compared to EA.¹³ Another advantage of CSE includes a lower maternal and umbilical cord blood concentration of local anesthetics.¹³

There are also disadvantages associated with using CSE. Local anesthetics should be injected into the epidural space in small increments to avoid severe hypotension¹⁵ in case the catheter has accidentally migrated into the subarachnoid space. The epidural injection of opiates with the CSE technique may be dangerous because of the potential for accidental catheter migration and injection of a large dose of opioid into the subarachnoid space with the ensuing risk of respiratory arrest.¹⁶ The incidence of meningitis after CSE may be higher than after spinal or EA.¹⁷ In our case, careful fluid administration under the guidance of invasive monitoring and a well-tailored regional anesthetic satisfied the anesthetic goals emphasized above.⁹

To our knowledge this is the first report of the use of CSE anesthesia in a patient with peripartum dilated cardiomyopathy. Although a single case has no role in predicting anesthetic outcome, we believe this case demonstrates that CSE anesthesia is an acceptable option for patients with peripartum dilated cardiomyopathy undergoing CS.

References

- 1 *Thornhill ML, Camann WR* Cardiovascular disease. In: Chestnut DH (Ed.). *Obstetric Anesthesia*. St. Louis: Mosby, 1994: 765.
- 2 *Homans DC* Current concepts. Peripartum cardiomyopathy. *N Engl J Med* 1985; 312: 1432–7.
- 3 *Heider AL, Kuller JA, Strauss RA, Wells SR* Peripartum cardiomyopathy: a review of the literature. *Obstet Gynecol Surv* 1999; 54: 526–31.
- 4 *Lampert MB, Lang RM* Peripartum cardiomyopathy. *Am Heart J* 1995; 130: 860–70.
- 5 *Brown CS, Bertolet BD* Peripartum cardiomyopathy: a comprehensive review. *Am J Obstet Gynecol* 1998; 178: 409–14.
- 6 *Chan F, Kee WDN* Idiopathic dilated cardiomyopathy presenting in pregnancy. *Can J Anesth* 1999; 46: 1146–9.
- 7 *Veille J-C* Peripartum cardiomyopathies: a review. *Am J Obstet Gynecol* 1984; 148: 805–18.
- 8 *Malinow AM, Butterworth JF, Johnson MD, et al.* Peripartum cardiomyopathy presenting at cesarean delivery. *Anesthesiology* 1985; 63: 545–7.
- 9 *Breen TW, Janzen JA* Pulmonary hypertension and cardiomyopathy: anaesthetic management for caesarean section. *Can J Anaesth* 1991; 38: 895–9.
- 10 *Sharrock NE, Bading B, Mineo R, Blumenfeld JD.* Deliberate hypotensive epidural anesthesia for patients with normal and low cardiac output. *Anesth Analg* 1994; 79: 899–904.
- 11 *Gambling DR, Flanagan ML, Huckell VF, Lucas SB, Kim JHK* Anaesthetic management and non-invasive monitoring for caesarean section in a patient with cardiomyopathy. *Can J Anaesth* 1987; 34: 505–8.
- 12 *Nam E, Toque Y, Quintard JM, Barsam E, Besserve P, Montravers P.* Use of transesophageal echocardiography to guide the anesthetic management of cesarean section in a patient with hypertrophic cardiomyopathy. *J Cardiothorac Vasc Anesth* 1999; 13: 72–4.
- 13 *Rawal N, Schollin J, Westrom G* Epidural versus combined spinal epidural block for cesarean section. *Acta Anaesthesiol Scand* 1988; 32: 61–6.
- 14 *Davies SJ, Paech MJ, Welch H, Evans SFG, Pavy TJ.* Maternal experience during epidural or combined spinal-epidural anesthesia for cesarean section: a prospective, randomized trial. *Anesth Analg* 1997; 85: 607–13.
- 15 *D'Angelo R, Eisenach JC* Severe maternal hypotension and fetal bradycardia after a combined spinal epidural anesthetic. *Anesthesiology* 1997; 87: 166–8.
- 16 *Myint Y, Bailey PW, Milne BR.* Cardiorespiratory arrest following combined spinal epidural anaesthesia for caesarean section. *Anaesthesia* 1993; 48: 684–6.
- 17 *Brown DL.* Spinal, epidural and caudal anesthesia. In: Chestnut DH (Ed.). *Obstetric Anesthesia*, 2nd ed. St. Louis: Mosby, 1999: 201.