

# Refractory hypotension under neuraxial anesthesia for cesarean delivery

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*To the Editor:* Aortocaval compression syndrome is also known as a supine hypotensive syndrome, it is very common in late pregnancy especially in supine positioning under neuraxial anesthesia. It is occurred when the inferior vena cava and the aorta were compressed by the uterus, and often manifested as hypotension, tachycardia, nausea, dizziness, and syncope. Besides, reducing of uteroplacental perfusion may result in morbidity or even mortality to the fetus. It is critical to recognize the cause of hypotension in the pregnant patient, and it is necessary to alleviate the compressing pressure of uterus on the inferior vena cava immediately if suspected of aortocaval compression. We report a pregnant woman with rheumatoid arthritis (RA) who experienced refractory hypotension resistant to large doses of vasopressor therapy when undergoing cesarean delivery with combined spinal-epidural anesthesia.

A 33-year-old G4P1 woman weighing 80 kg and 165 cm tall at 38<sup>+6</sup> weeks of gestation were scheduled for a cesarean delivery. She had a previous history of RA for 11 years and had been taking oral prednisone (10 mg) every morning for more than 5 years. She started taking prednisone during her first pregnancy, her first cesarean section was elective on social factor and her circulatory system was stable. During this pregnancy, her RA was stable and she did not have low back pain or spine deformity. Her echocardiography, electrocardiogram (ECG), liver and kidney function, coagulation, and blood platelet analyses were normal. She voluntarily stopped taking prednisone this morning for the doctor asked her not to take anything and did not remind her to insist to take medicine. Considering she had no contraindication to neuraxial anesthesia, we chose combined spinal-epidural anesthesia.

The patient's vital signs in the operating room were as follows: heart rate (HR): 85 beats/min, blood pressure (BP) 120/75 mmHg (1 mmHg = 0.133 kPa), and SPO<sub>2</sub> 98%. She was positioned in the left lateral position for neuraxial

anesthesia. The puncture process was smooth, and 2.2 mL of 0.5% hypobaric bupivacaine were administrated to the subarachnoid space at L3-4. When the patient straightened to the supine position, she suddenly exhibited extreme irritability, sweating, complained of palpitations, and extreme discomfort, she even sat up on her own and shook her limbs. We let her to lie in semireclining position, displaced her uterine to left, and supplemented oxygen. Her vital signs were as follows: HR 134 beats/min, BP 110/94 mmHg, SPO<sub>2</sub> 98%. Meanwhile, her sensory block level was T12. Large doses of phenylephrine and ephedrine were intermittently administrated, but her BP continued to decrease and reached 70/26 mmHg at its lowest point. The maximal sensory block level was T6 and double lung breath sounded clear symmetry, the patient stayed awake and irritable. The blood gas analysis showed as the following: pH 7.31, pCO<sub>2</sub> 31.3 mmHg, base excess (BE) -7 mmol/L, HCO<sub>3</sub><sup>-</sup> 18.5 mmol/L, K<sup>+</sup> 3.3 mmol/L, Na<sup>+</sup> 138 mmol/L, hematocrit (HCT) 29%, Hb 9.9 g/L, oxyhemoglobin saturation (SO<sub>2</sub>) 100%, and Glu 7.3 mmol/L. After rapid rehydration, large doses of phenylephrine (2.1 mg) and ephedrine (48 mg), and 200 mg hydrocortisone were administrated, her BP (130/76 mmHg) appeared to transiently recovery and then dropped again to 55/38 mmHg. Large doses of phenylephrine (1.1 mg) and ephedrine (36 mg) were intermittent administrated. Then, her BP returned to normal and she felt much comfortable. The total treatment administration was phenylephrine 3.2 mg, ephedrine 84 mg, hydrocortisone 200 mg crystalloid 1500 mL and colloidal 500 mL. The BP fluctuation time continued for more than 20 min [Table 1]. After the situation improved, cesarean delivery was immediately completed. A girl baby was successfully delivered with an Apgar score of 10-10-10, and the mother recovered well.

Most pregnant women have adequate compensatory system which increasing systemic vascular resistance and HR to prevent aortocaval compression syndrome.<sup>[1]</sup> Aortocaval compression can be alleviated by manual

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**Table 1: Vital signs, symptoms, and treatment after spinal anesthesia.**

Time	HR (beats/min)	NIBP (mmHg)	SpO <sub>2</sub> (%)	Symptoms	Treatment
On arrival	85	120/75	98	None	None
After block	134	110/94	98	Extreme irritability, shake limbs, sat up on her own, diaphoresis, palpitations	Positioned semireclining, displaced uterine to left, fluid resuscitation, supplemental oxygen, phenylephrine 0.1 × 2 mg
2 min	146	96/87	98	As above	Phenylephrine 0.1 × 2 mg
4 min	106	87/49	99	As above	Phenylephrine 0.1 × 4 mg, ephedrine 6 mg × 2
6 min	92	70/26	99	As above	Phenylephrine 0.1 × 6 mg, ephedrine 6 mg × 2, hydrocortisone 100 mg
8 min	103	68/47	99	As above	Phenylephrine 0.1 × 4 mg, ephedrine 12 mg, hydrocortisone 100 mg
9 min	103	89/42	99	Little remission	Phenylephrine 0.1 × 3 mg, ephedrine 12 mg
11 min	82	113/63	99	Much remission	None
14 min	72	130/76	99	Much remission	None
16 min	115	84/33	99	palpitations	Phenylephrine 0.1 × 2 mg
17 min	101	55/38	99	Extreme irritability, diaphoresis, palpitations	Phenylephrine 0.1 × 2 mg, ephedrine 12 mg
18 min	97	74/38	99	As above	Phenylephrine 0.1 × 2 mg, ephedrine 12 mg
20 min	93	91/33	99	Little remission	Phenylephrine 0.1 × 3 mg
24 min	137	79/57	99	Little remission	Phenylephrine 0.1 × 2 mg, ephedrine 12 mg
27 min	92	107/71	99	Much remission	None

HR: Heart rates; NIBP: Non-invasive blood pressure; SpO<sub>2</sub>: Pulse oxygen saturation. 1 mmHg = 0.133 kPa.

**Table 2: Clinical features of the four cases of severe and rapid haemodynamic disorders in pregnant patients under neuraxial anesthesia.**

Authors	Age (years)	Weeks of gestation	Causes	Anesthesia	Symptom	Treatment
Johnson <i>et al</i> <sup>[5]</sup>	31	34	Undiagnosed pheochromocytoma	Intrathecal hyperbaric bupivacaine 12 mg, fentanyl 25 µg, and morphine 100 µg	Lightheaded, nausea, vomiting	Left uterine displacement, emergent cesarean delivery, ephedrine 60 mg and phenylephrine 250 µg
Murphy <i>et al</i> <sup>[4]</sup>	26	20	Aortocaval compression	Intrathecal hyperbaric 0.5% bupivacaine 9 mg, change to general anesthesia	Markedly symptomatic: dizzy, nausea, lost consciousness	Full left lateral position, emergency caesarean delivery, large dose of ephedrine and phenylephrine
Bouvet <i>et al</i> <sup>[3]</sup>	28	Do not know	Aortocaval compression	Intrathecal bupivacaine 10 mg, sufentanil 5 µg, morphine 0.1 mg, clonidine 30 µg	Hypotension	Operating table tilted to the left, Ephedrine 103 mg, phenylephrine 1430 µg and a norepinephrine infusion at 1 mg/h
Coffman <i>et al</i> <sup>[2]</sup>	35	36	Aortocaval compression with Marfan syndrome	Intrathecal bupivacaine 0.5 mL (0.75%), 15 µg fentanyl, and 100 µg morphine, change to general anesthesia	Nausea, hypotension	Phenylephrine infusion 50 µg/min, cesarean delivery in the lateral position

displacement of the uterus, fluid resuscitation, and vasopressors. It rarely results in cardiovascular collapse when all these resuscitative measurements have taken. Upon reviewing of published literature of similar cases, we found four cases of severe and rapid haemodynamic disorders in pregnant patients under neuraxial anesthesia.<sup>[2-5]</sup> We extracted the gestational weeks, anesthesia, causes, symptom, and treatment into Table 2. We could conclude

from these cases when refractory hypotension resistant to high doses of vasopressors occurs, emergent cesarean delivery might be the most effective method. Because of severe hypotensive in pregnant patient may result in morbidity or even mortality to the fetus, the multiple causes should be comprehensively considered and treated expeditiously. Diagnosis of aortocaval compression is usually based on clinical manifestation and assessment.

The patient in our study experienced refractory hypotension was initially suspected of excessive block and supine hypotension syndrome. After checked the sensory block level (T6) and administered rapid rehydration and large doses of vasopressors, we excluded these causes. She had a history of cesarean delivery under spinal anesthesia, the current medication was only Ringer's lactate and we did not see other allergy symptoms; therefore, we also eliminated anaphylactic shock. Since the random blood sugar was 7.3 mmol/L, we also excluded hypoglycemia shock. The patient had a history of RA and regularly taken 10 mg prednisone for more than 5 years, so we tend to consider adrenal crisis. After received 200 mg hydrocortisone and large doses of vasopressors, the BP appeared to transiently recovery (4 min) and then dropped again. We doubted the diagnoses of adrenal crisis, as the temporal sequence of events does not so highly suggest, but stress doses of corticosteroid insufficiency contributed to the severe hypotension. After reviewed of literatures and based on her clinical symptoms and exclusion diagnosis, the diagnoses of this patient highly suggested to be severe aortocaval compression.

The downside in this case was we did not employ emergent cesarean delivery. The circulatory system of the patient collapsed for more than 20 min in this case, this severe hypotensive might result in morbidity or even mortality to

the fetus. We suggested that when refractory hypotension resistant to high doses of vasopressors occurs, emergent cesarean delivery should be employed.

### Conflicts of interest

None.

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