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Case Report

Anaesthetic Management for Caesarean Section Surgery in Two Pregnant Women with Severe Pulmonary Hypertension Due to Mitral Valve Stenosis

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ABSTRACT

Background: Mitral stenosis is the most important and common cardiac complication seen during pregnancy. Conception is discouraged in cases where pulmonary hypertension develops during the course of mitral stenosis. Successful general and regional anaesthetic interventions have been reported in some cases of severe pulmonary hypertension.

Case Reports: We present our experiences with anaesthetic management in two pregnant patients with pulmonary hypertension due to mitral valve stenosis.

Conclusion: We preferred to continue spinal anaesthesia because gradually increasing the local anaesthetic dose during the procedure may minimise probable undesirable haemodynamic changes, such as hypotension and tachycardia.

Key Words: Mitral Stenosis, pulmonary hypertension, caesarean section, regional anaesthesia

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Introduction

Pulmonary arterial hypertension (PAH) is defined as a mean pulmonary artery pressure greater than 25 mmHg at rest and greater than 30 mmHg with exercise (1). Maternal mortality rises up to 15% in mitral stenosis cases complicated with pulmonary hypertension (2). Pregnancy-induced physiological changes also result in a deterioration of existing cardiac pathology. The European and American Cardiology Associations have recommended that patients with PAH are not encouraged to get pregnant and any pregnancy must be terminated (3). The implementation of general anaesthesia (4), combined spino-epidural anaesthesia (5), epidural anaesthesia (6), and continuous spinal anaesthesia (7) in pregnant women with PAH has been reported in the literature. We present two cases of PAH due to mitral valve disease in pregnant patients.

Case Reports

Case 1

The patient underwent an emergency Caesarean section (CS) operation under general anaesthesia for the first CS due to the development of foetal distress. Continuous spinal anaesthesia was planned during the operation for the second CS. The patient was transferred to the operation room. The central venous pressure and the arterial pressure were monitored via central venous catheterisation through the internal jugular vein and radial artery catheterisation under local anaesthesia, respectively. Standard monitoring included evaluation of the peripheral oxygen saturation and electrocardiography. The central venous pressure, heart rate, and arterial blood pressure were 15 mmHg, 84 beats/min, and 120/70 mmHg, respectively. Following administration of subcutaneous anaesthesia in the sitting position under aseptic conditions, a spinal catheter (B. Braun®, Melsungen, Germany) was inserted through the intervertebral space between the L4-L5 vertebrae. Then, 1 mL 0.5% plain bupivacaine was injected through the catheter. The sensorineural block level was found to be at T10. After administration of a second dose of 0.5 mL 0.5% plain bupivacaine, the sensorineural block level was raised to T6, followed by commencement of the operation. The operation comprised a Caesarean section and tube ligation. The patient complained of pain following extraction of the baby, and 0.2 mL 0.5% plain bupivacaine was re-administered, raising the sensorineural block level to T4. The operation was not complicated by bradycardia or hypotension. The patient was administered a total of 700 mL of fluid (lactated Ringer's solution) during the operation. Prior to transferring the patient to the intensive care unit, the spinal catheter was removed. Postoperative pain management was achieved intravenously by a patient-controlled analgesia (PCA) pump (fentanyl 20 µg/h with a bolus dose of 20 µg and a loading dose of 30 µg). The patient had been taking low-molecular-

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Table 1. Demographic properties, preoperative condition, and outcome of patients

	Case 1		Case 2
	1st CS	2nd CS	
Age (years)	24	31	30
Gestation week	35	38	37
History	Open mitral commissurotomy at 10 years of age	Open mitral commissurotomy at 10 years of age	Balloon valvuloplasty at 25 years of age
Physical examination	Ortopnoea, dyspnoea, peripheral edemas, S3 Gallop	Peripheral edemas (+3), dyspnoea, S3 gallop rhythm	Severe orthopnoea, dyspnoea, peripheral edemas (+3)
ECHO findings	Moderate degree of mitral stenosis (mitral valve area= 1.2 cm^2), severe tricuspid regurgitation, PAP=45 mmHg	Severe mitral stenosis (mitral valve area=0.9 cm^2), severe tricuspid regurgitation, PAP=50 mmHg	Mitral valve area=1.9 cm^2 (1.2 cm^2 before the balloon valvuloplasty), PAP=60 mmHg
NYHA class	Class 3	Class 4	Class 4
Medication	Furosemide 40 mg twice daily, metoprolol succinate 100 mg once daily	Metoprolol succinate 50 mg and furosemide 40 mg twice daily	Metoprolol succinate 50 mg, furosemide 40 mg twice daily.
Cause of Caesarean delivery	Development of foetal distress. Performed emergent Caesarean delivery	Previous Caesarean section	The cardiologist decided for termination of pregnancy due to patient's clinical status (pulmonary edema)
Type of anaesthesia	General anaesthesia	Continuous spinal anaesthesia	Continuous spinal anaesthesia
Discharge time	7 days	3 days	5 days
Outcome	Mother and baby are healthy. Pregnancy was banned for patient	Mother and baby are healthy. Recommendations about diuretic usage and subsequent outpatient cardiology visits. Two years later, she underwent mitral valvuloplasty	Mother and baby are healthy. Recommendations about diuretic usage and subsequent outpatient cardiology visits. Pregnancy was banned for patient

CS: caesarean section; PAP: pulmonary arterial pressure; NYHA: New York heart association

weight heparin treatment throughout the pregnancy period. Following the removal of the spinal catheter, the same antithrombotic therapy was reinstituted. The patient was closely monitored by a cardiologist for 24 hours in the intensive care unit.

Case 2

Preanaesthetic monitoring was performed as Case 1. The central venous pressure, heart rate, and arterial blood pressure were 20 mmHg, 85 beats/min, and 110/60 mmHg, respectively. Continuous spinal anaesthesia was administered through the intervertebral space between the L4-L5 vertebrae. Then, 1mL 0.5% of plain bupivacaine was administered to the patient in a sitting position, following which she was returned to a supine position. An additional dose of 0.5 mL 0.5% bupivacaine was re-injected after checking that the sensorineural level was at T7. The operation was commenced when the sensorineural level was raised to T4. The arterial blood pressure dropped by 20%, and 15 mg of ephedrine was administered. No bradycardia was observed. The patient was administered a total of 500 mL fluid (0.09% NaCl solution) during the operation. Following the removal of the spinal catheter, postoperative analgesia was achieved intravenously with a PCA pump (fentanyl 20 µg/h with a bolus dose of 20 µg and a loading dose of 30 µg). Low-molecular-weight heparin, which had been suspended 24 hours before the operation, was reinstituted.

Discussion

The intravascular volume increases by 50% during pregnancy. Consequently, the filling pressure of the left atrial and pulmonary veins rises. Moreover, the increased heart rate reduces the left ventricular filling time. These physiological changes lead to serious haemodynamic problems in patients with mitral stenosis (2).

There is no currently no consensus on the choice of anaesthetic management, which depends on the severity of the disease. A review of case presentations published between 1997 and 2007 revealed a higher rate of maternal mortality

in patients undergoing Caesarean section surgery under general anaesthesia because volatile agents utilised in general anaesthesia may depress cardiac contractility, positive pressure ventilation may increase pulmonary resistance, and laryngoscopy and orotracheal intubation may lead to elevation of pulmonary arterial blood pressure (8).

In the studies conducted, general anaesthesia was implemented in emergency Caesarean sections, but neuroaxial block was preferred in elective cases (4-6). However, we used neuroaxial anaesthesia in our emergency case.

Kocum et al. (2) described a Caesarean section with mitral stenosis complicated with pulmonary hypertension that they successfully managed with epidural anaesthesia. They have suggested that close haemodynamic monitoring and careful titration of epidural anaesthesia are essential to prevent an extreme decrease in cardiac preload.

A previous study reported that haemodynamic changes returned to preconception levels within 15 days postpartum and that maternal mortality occurred most frequently in the first few days following the delivery (9). It also emphasised the need for meticulous fluid management and monitoring before and after the delivery in patients with pulmonary hypertension, in addition to the continuation of vasodilator therapy and the implementation of anticoagulation therapy in the early postpartum period in patients with pulmonary hypertension.

Gandhimathi et al. (7) administered continuous spinal anaesthesia during a Caesarean section in a patient with pulmonary hypertension who gave birth to twin babies. They reported successful anaesthetic management, as well as adequate surgical comfort and minimal variation in haemodynamic parameters. Dresner et al. (10) reported the use of continuous spinal anaesthesia in 34 Caesarean sections in patients with complex cardiac disease. They stated that they achieved perfect haemodynamic stability by effectively titrating the local anaesthetic agents. Craig et al. (11) underlined in their review that continuous spinal anaesthesia used during Caesarean section surgeries in patients with significant cardiac disease could allow for implementation of local anaesthetics in divided doses, thereby gaining time in order to compensate for the development of unwanted side-effects.

In conclusion, epidural, spinal, or continuous spinal anaesthesia can be performed and monitored during Caesarean sections in patients with mitral stenosis complicated with PAH. We preferred continue spinal anaesthesia because gradually increasing the local anaesthetic dose during the procedure may minimise probable undesirable haemodynamic changes, such as hypotension and tachycardia. Cautious postpartum fluid management and close monitoring are vital during the early postpartum period.

Ethics Committee Approval: *Ethics committee approval was received for this study from the Atatürk University Faculty of Medicine Ethics Committee (2013/6 - 46)*

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