Case Report

Combined mitral and aortic stenosis in parturient: Anesthesia management for labor and delivery

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Abstract

Maternal heart disease complicates 0.2-3% of pregnancies. The optimal management of the pregnant patient with cardiac disease depends on the co-operative efforts of the obstetrician, the cardiologist and the anesthesiologist involved in peripartum care. A comprehensive understanding of physiology of pregnancy and pathophysiology of underlying cardiac disease is of primary importance in provision of obstetric analgesia or anesthesia for these high-risk groups of patients.

We report a successful and uncomplicated use of epidural anesthesia for labor and delivery in patient with combined aortic and mitral stenosis.

Key words: Epidural analgesia, mitral and aortic stenosis, pregnancy

Introduction

Cardiovascular disease is the most common cause of nonobstetric maternal mortality.[1] Cardiac lesions worsen during gestation as cardiovascular and physiological changes of pregnancy results in depressed cardiovascular functions. Women deteriorate from New York Heart Association class 1-3 or 4 due to physiologic changes, to support the growth, development and delivery of the baby. There is considerable debate as to the optimal anesthetic management for lower segment cesarean section (LSCS), with some recommending use of regional anesthesia, while others prefer general anesthesia.[2]

The choice of anesthesia should be appropriate to ensure the well-being of mother and fetus. We report the titrated epidural analgesia with assisted second stage of labor for smooth vaginal delivery in a patient with severe mitral and aortic valve stenosis.

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Access this article online	
Quick Response Code:	Website: www.joacp.org
	DOI: 10.4103/0970-9185.168169

Case Report

A 32-year-old parturient (gravida 2, para 1) was admitted in our tertiary care hospital at 32 weeks gestation. She was diagnosed case of severe mitral and aortic valve stenosis since 6 years. She was on antibiotic prophylaxis and thiazide diuretic. Her past pregnancy was uneventful, with spontaneous vaginal delivery at term under epidural analgesia. Her current pregnancy is uneventful except intermittent dyspnea beginning in the second trimester. As per the cardiologist, she was a very high risk for normal vaginal delivery due to severe valvular obstructive lesions.

When reviewed by a cardiologist at 32 week's gestation, she has a systolic ejection murmur graded 6/6 at the second left intercostal space radiating to the neck. The electrocardiogram showed normal sinus rhythm (NSR) of 95/min with a normal axis, left ventricular hypertrophy and blood pressure (BP) of 120/60 mmHg. Echocardiography revealed severe mitral (valve area: 0.6 cm^2) and aortic valve stenosis (aortic area: 0.8 cm^2) with mild pulmonary hypertension (40 mm Hg). Hematological and biochemical investigations were normal.

A multidisciplinary meeting involving obstetrician, cardiologist and anesthesiologist was held to determine the appropriate management strategy. She was counseled for epidural analgesia for labor, on the premise that elective induction at 39 weeks preceded by an epidural analgesia would minimize physiological changes and subsequent complications during delivery.

At 39 week's gestation, patient was admitted to the obstetrical unit. At that time, she had sinus rhythm, normal BP and no symptoms of cardiac failure. The options for analgesia during labor and delivery, and anesthesia for LSCS, were discussed in detail with the patient along with the risks and benefits. She requested epidural analgesia, and written informed consent was obtained.

At 39.2 weeks elective induction of labor was planned, and patient was shifted to obstetric theatre for placement of the epidural catheter. All emergency cardiac drugs, defibrillator and equipments for resuscitation were kept ready. Baseline hemodynamic parameters were noted (pulse: 76/min NSR, BP: 124/76 mm Hg, SpO_2: 100%). Intravenous access secured with 18 gauge cannula and ringer lactate was started at 2 ml/kg/h. Under local anesthesia, right radial artery (20 guage jelco) and right internal jugular vein (Teleflex Medical Arrow 7 F triple lumen) were cannulated for continuous invasive BP and central venous pressure (CVP) monitoring. CVP was 2-4 cm of water.

Epidural procedure explained to the patient. Under all aseptic precaution with patient in sitting position 1.5 ml of 2% lignocaine infiltrated in L2-L3 interspace. Epidural space entered with B. Braun 18 G Tuohys epidural needle with loss of water resistance technique, and 20 guage epidural catheter was passed up to 4 cm mark through the needle. The catheter was secured in place at 10 cm mark following negative aspiration for blood and cerebrospinal fluid. The patient was moved to the supine position with moderate left lateral tilt to avoid aorto-caval compression. Oxygen was administered through a Hudson mask at 5 l/min.

Patient was transferred to cardiac Intensive Care Unit (ICU) and dinoprostone gel was inserted per vaginally by gynecologist. She went into an active phase of labor after 6 h of cerviprime instillation with uterine activity of 2-3 contractions/10 min. Vaginal examination revealed that cervix was 4 cm dilated and 60% effaced. A carefully titrated mixture of fentanyl 2 μg/ml and 0.125% bupivacaine was given through the epidural catheter with continuous monitoring of vital parameters. A total of 16 ml was given to ensure that the patient had analgesia up to T10 dermatomal level without motor blockade. The patient remained pain free and hemodynamically stable throughout the first stage of labor (pulse rate: 65-80/min, systolic BP: 80-120, CVP: 4-6 cm of water, SpO_2: 98-100%). To avoid the cardiovascular stress with pushing and straining in the second stage of labor, a forceps delivery was planned. When the cervix was fully dilated, and all the prerequisites for a forceps delivery were met, they were applied to assist in a smooth vaginal delivery. Prior to this, the patient was made to sit and a second dose of the epidural analgesia (8 ml of 0.125% bupivacaine and 2 μg/ml fentanyl) was administered so that predominant analgesia of the perineum could be achieved. The patient remained pain free and hemodynamically stable during this stage. A 2800 g female who had Apgar scores of 9/10 after 1 and 5 min, respectively, was delivered vaginally. 20 units oxytocin was started by infusion to prevent the cardiovascular effects of the bolus dose which include hypotension, tachycardia, and fluid retention.[3] Following delivery, the patient remained in the ICU with continuous monitoring for 24 h. No cardiovascular events were reported, and she was shifted to the postnatal ward. Following an uneventful recovery, she was discharged and advised to undergo double valve replacement.

Discussion

Cardiovascular stress due to pregnancy, labor and delivery is challenging for anesthesiologist for management of pregnant cardiac patient. In general regurgitant lesions are well tolerated and stenotic lesions are poorly tolerated during pregnancy.[1,4] LSCS is usually performed for cardiac patients to avoid undesirable effects of pain and marked valsalva effect of prolonged efforts at pushing in the second stage of labor.[5,6]

The critical problem in parturient with aortic stenosis is the inability to maintain cardiac output in the presence of decreased systemic vascular resistance (SVR). Sympathetic blockade associated with epidural anesthesia can cause decreased preload and diastolic pressure leading to myocardial ischemia with cardiac failure. When mitral and aortic stenosis co-exist the clinical features of mitral stenosis usually predominates.[2] The co-existing mitral stenosis reduces left ventricular filling resulting in decreased cardiac output. Thus, the use of epidural analgesia in our case with combined stenosis seemed to be beneficial.

The physiological changes associated with pregnancy have important consequences on hemodynamic parameters in patients with underlying heart disease.[7]

A 50% increase in intravascular volume occurs during normal pregnancy by mid third trimester. There is 50% increase in cardiac output, mainly in the first and second trimesters. Later, the increase in cardiac output is sustained by an increase in heart rate.[8] The requirements for an increase in cardiac output and heart rate can lead to decompensation aortic stenosis.

During labor, cardiac output increases by a further 45% above the pre-labor level. With each contraction, up to 500 ml of blood is displaced from the uterus into the circulation. After delivery of the baby, auto-transfusion occurs from the placenta into the maternal circulation. This will increase the cardiac

output and stroke volume by about 80%. Thus the periods of greatest risk for cardiac events are earlythird trimester, during labor and delivery and the immediate postpartum period.

Case series of women with aortic stenosis have shown that pregnancy is well-tolerated when the patients were asymptomatic before pregnancy.[3,9] In patients with mild or moderate aortic stenosis no cardiac complications were observed during pregnancy, while cardiac events were observed in 10% of all women with significant aortic valve stenosis. The use of neuraxial block in the patient with clinically significant cardiac disease is a controversial issue because of possible cardiovascular fluctuation with blockade of the autonomic system.[10-12] Historically, anesthesiologists have avoided regional anesthesia in the parturient with cardiovascular disease because of the adverse cardiovascular changes in a patient with a fixed cardiac output. Hypotensionin these patients can produce myocardial ischemia. Since epidural analgesia reduces catecholamine release and hemodynamic stress, it is used in low concentrations for vaginal delivery in these patients. Suntharalingam *et al*. used the low dose technique with 0.1% bupivacaine and fentanyl and concluded that epidural analgesia may be used for delivery in aortic stenosis with close hemodynamic monitoring.[7]

The goals of management for patients with mitral and aortic stenosis are:

1. Maintain sinus rhythm.
2. Avoid both tachycardia and bradycardia.
3. Maintain adequate preload.
4. Maintain SVR.
5. Avoid myocardial depression.
6. Avoid aorto-caval compression.

Conclusion

Our study showed that the vaginal delivery under low dose epidural analgesia is successful and safe alternative to LSCS for pregnant cardiac patients. For optimal maternal and fetal outcomes, these patients must be managed through multidisciplinary approach involving obstetrician, anesthesiologists and cardiologists. Pregnant patient with significant multivalvular heart disease requires careful preoperative assessment and planning to optimize cardiac function and to decide the mode of delivery and anesthetic technique. High risk pregnant cardiac patient requires intensive care with monitoring as period particularly after the delivery carries high risk of maternal death.

If oxytocin is required postdelivery, it should be given by infusion to avoid the potential cardiovascular effects of the bolus dose.

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How to cite this article: Kela M, Buddhi M. Combined mitral and aortic stenosis in parturient: Anesthesia management for labor and delivery. J Anaesthesiol Clin Pharmacol 2017;33:114-6.
Source of Support: Nil, **Conflicts of Interest:** None declared.