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CASE REPORT

Anesthesia Management for Section Cesarean Delivery in Patient with Severe Mitral Stenosis

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ABSTRACT

Background: Heart defects in pregnancy is one main nonobstetric factor causing morbidity and mortality in pregnant women. Mitral stenosis is common in pregnancy. The choice of anesthetic management has to consider hemodynamics, type of heart disease, and drugs used. Neuraxial anesthesia has been significantly used because it is considered safer than general anesthesia

Case: A 26-year-old woman with gestational age 32-34 weeks with severe mitral stenosis, moderate mitral regurgitation, severe tricuspid regurgitation, pulmonary hypertension, pericardial effusion, and atrial fibrillation underwent cesarean section with a low dose of spinal anesthesia using 5mg bupivacaine heavy 0.5% and Fentanyl 50 mcg. The sensory and motoric block was achieved in 5 minutes. Hemodynamic was stable during the perioperative phase. There was no heart failure or postoperative hemodynamic deterioration.

Conclusion: Low-dose spinal anesthesia using 5 mg of bupivacaine and fentanyl adjuvant can be used in cesarean section in patients with severe mitral stenosis due to rapid onset, adequate block level, stable hemodynamic, block duration, and healthy born babies.

Keywords: Pregnancy; mitral stenosis; C-section; neuraxial block; low dose

INTRODUCTION

Cardiac abnormalities during pregnancy are still the main non-obstetric factors causing morbidity and mortality in pregnant women. In the United States, complications of heart disease are found in about 4% of all pregnancies. Maternal heart disease have a mortality risk of (10%-25%)[1]. Mitral stenosis is the most common valve disorder associated with rheumatic fever. The pathological abnormalities of mitral stenosis in pregnancy are associated with the presence of acute pulmonary edema and aortic valve disease. Symptoms that arise depend on the severity of mitral stenosis, including fatigue and dyspnea at first, then can cause paroxysmal nocturnal dyspnea, orthopnea, and shortness of breath at rest. The mortality rate alone is about 1% in mild mitral stenosis and 5-15% in severe mitral stenosis. Nowadays, a cesarean section in pregnant patients with mitral stenosis is still a challenge for anaesthesiologist in providing appropriate anaesthetic management [2,4].

Spinal anesthesia is the most often used technique in cesarean sections (CS), but there are some concerns about use of spinal anesthesia in patients with cardiac disease. It has been contraindicated in some specific heart disease like mitral stenosis due to risk of hemodynamic instability. Recent studies, however, have proved hemodynamic changes in spinal anesthesia to be dose dependent. An inadequate dose might lead to inadequate block and maternal-fetal hemodynamic changes due to pain or discomfort. The addition of opioids could reduce the dose requirements of local anesthetics and prevent hemodynamic fluctuations and increase the effects of intraoperative and postoperative analgesia[1].

CASE ILLUSTRATION

A 26-year-old woman with a gestational age of 32-34 weeks with severe mitral stenosis, moderate mitral regurgitation, severe tricuspid regurgitation, pulmonary hypertension, pericardial effusion, and atrial fibrillation underwent cesarean section. From the anamnesis, the patient complained of shortness of breath since the gestational age of 5 months. Shortness of breath increases with activity and decreases with rest. During treatment, the patient received therapy with furosemide,

digoxin, warfarin. From the examination, the respiratory rate was 20x/minute, with 100% oxygen saturation using a 10 lpm NRBM. Patients with blood pressure 94/46 and pulse 58-70 beats/minute irregular. From the heart sound, there was an s3/6 murmur with a maximum punctum at the apex. From the laboratory examination we get:

Table 1. Laboratory Examination Data

	21-9-18	24-9-18 (05.51)	24-9-19 (18.00)
CBC	10,8/7610/33,4/285.000		
SE	138/5,04/107		
PPT	10,3/10,9	12,1/11.1	9,7/1 1,1
INR	0,99	1,17	0,93
APTT	22,3/24,7	29,9	29,8/24,8
Ur/Cr	13,9/0,54	24,7	
UL	protein +2		

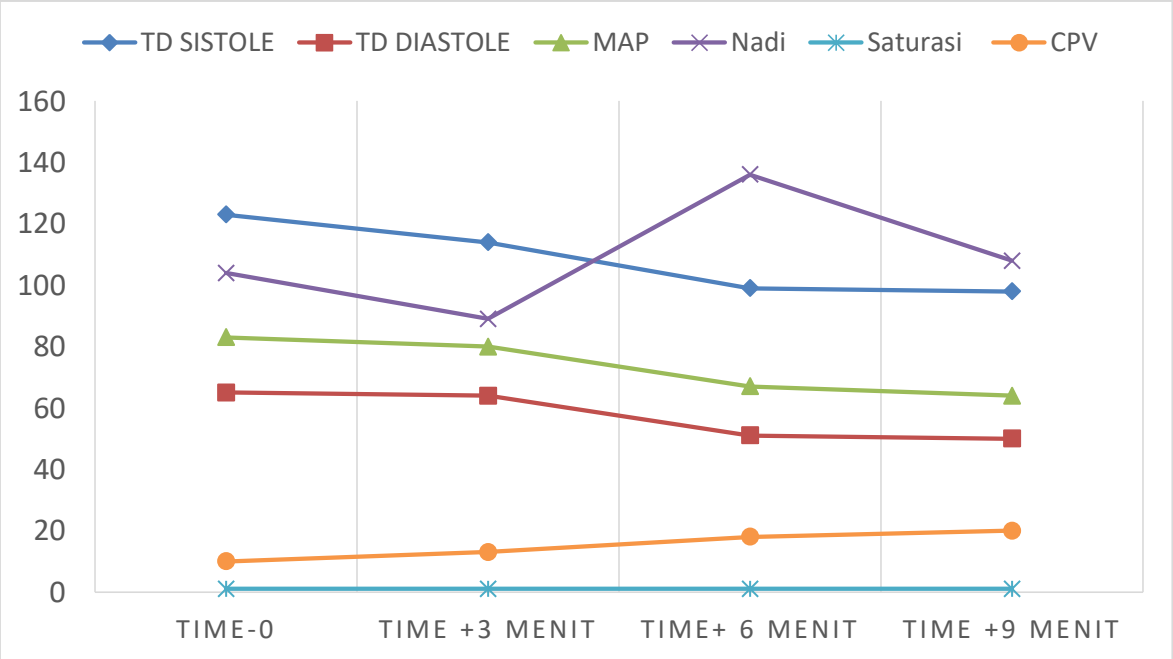

Figure 1. Hemodynamics Durante surgery (Post Induction)

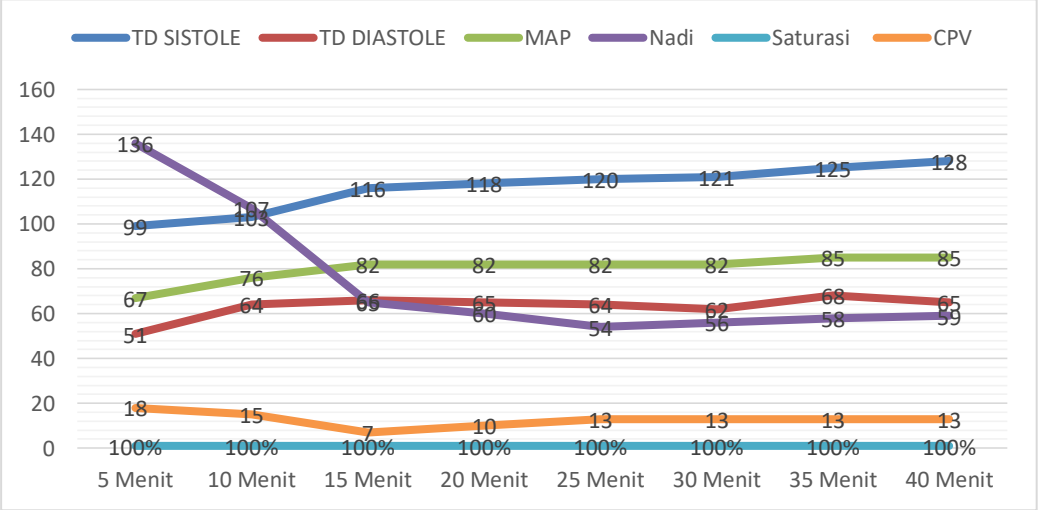

Figure 2. Hemodynamics Durante Surgery

From the echocardiographic examination, it was found that severe mitral stenosis, moderate mitral regurgitation, severe tricuspid regurgitation, mild aortic regurgitation, and mild pulmonary regurgitation, dilatation of the right atrium and right ventricle, large left atrium, spontaneous echo contrast in the left atrium, pulmonary hypertension and minimal pericardial effusion. without chamber collapse. Chest x-ray showed cardiomegaly with a CTR of 70%.

The operation was performed with preparation for the installation of an arterial line and a central venous catheter before induction. Induction of anesthesia with the neuraxial block using bupivacaine heavy 0.5% 5 mg with fentanyl 50 mcg, total volume 2cc.

DISCUSSION

A regional anesthetic technique was chosen considering that the clinical condition was still good. Patients can still sleep on their back with oxygen saturation using room air 96-97%. The main principles of anesthesia in patients with mitral stenosis are avoiding tachycardia, maintaining sinus rhythm conditions and aggressively dealing with new occurrences of atrial fibrillation both pharmacologically and with cardioversion, especially in patients with poor hemodynamics, avoiding a decrease in SVR which will cause compensation in the form of an increase in blood pressure. heart rate so that it aggravates the work of the heart, avoiding hypovolemia and fluid overload,

avoiding factors that can increase pulmonary artery pressure such as hypoxia and hypercarbia as well as pain[5,6].

Increased heart rate (sinus tachycardia), atrial fibrillation can shorten the diastolic filling period which will interfere with left atrial emptying thereby increasing the pressure difference across the mitral valve and resulting in increased pressure in the left atrium. In addition, atrial fibrillation can also reduce left ventricular filling so that it affects the cardiac output. 5 mg bupivacaine heavy 0.5% with adjuvant fentanyl 50 mcg with a total volume of 2 ml using a 27-G needle is inserted through the tuffier's line and then the patient is positioned supine immediately after injection, without head up or head down. We found that Bromage 2 scores were achieved in 65 seconds, Bromage 1 in 89-99 seconds, and Bromage 0 was achieved in 150-170 seconds after insertion. While the height of the T6 block is reached in 4 minutes. Incision time is between 5 minutes to 10 minutes. Low doses of hyperbaric bupivacaine combined with fentanyl provide the adequate block with minimal systemic side effects, such as decreasing systemic vascular resistance and preventing hypotension during spinal anesthesia. Because uterine blood flow is not auto-regulatory, uteroplacental perfusion is directly related to maternal blood pressure. Therefore, the decrease in maternal blood pressure can still be tolerated by the mother but not by the fetus. One strategy to maintain stable hemodynamics during spinal anesthesia at cesarean section is to use low-dose bupivacaine in combination with an opioid adjuvant. In this case report, we also did not find any episodes of hypotension and desaturation.

Intrathecal local anaesthetics work by blocking voltage-gated sodium channels in the spinal cord that affect motor and sensory impulses from afferent and efferent fibers. The extent of this sensory and motor block depends on the technique, agent and dose administered. Opioids administered to the intrathecal space selectively produce analgesia by interacting with opioid receptors in the dorsal horn of the spinal cord and thereby minimising the dose and supra spinal effects of local anesthetics such as hypotension,

respiratory depression, sedation and nausea, and vomiting[7]. The main location of opioid receptors in the dorsal horn of the spinal cord and thus can minimize the dosage and supraspinal effects of local anesthetic such as hypotension, respiratory depression, sedation and nausea and vomiting. The main location of the opioid receptors is in the substantia gelattinosa. This is the basis of the anatomy of selective abalgesia by intratechal opioid[3,7].

There have been many studies that prove the effectiveness of the use of opioids in spinal anesthesia, especially in cesarean section. Previous studies have shown that lipophilic opioids such as fentanyl can hasten the onset and prolong the duration of bupivacaine block, as well as prolong the duration of postoperative analgesia. The combination of the two has a speed of onset of 5 minutes intrathecally and 10 minutes via epidural and has a relatively shorter duration of action due to redistribution (2-4 hours intrathecal and epidural). No active metabolites were found and it is 800 times more fat-soluble than morphine. And because of its very high lipid solubility, it will quickly bind to opioid receptors in the dorsal horn of the spinal cord, and this rapid onset is very beneficial both as analgesia in normal labor and cases of emergency cesarean section.

Low doses of bupivacaine have been used by cesarean section (eg bupivacaine 5 mg with fentanyl 25 mcg). Its main principle is to reduce hypotension. The incidence of hypotension was approximately 31% in patients given 5 mg bupivacaine in combination with 25 mcg fentanyl when compared with patients receiving only 10 mg bupivacaine without an opioid where the incidence of hypotension was 94%. Hyperbaric spinal anesthetic solutions have also been prepared by combining local anaesthetic solutions with dextrose (glucose). The local anesthetic density is directly proportional to the dextrose concentration. However, in non pregnant women, lower dextrose concentrations have been shown to have a concentration-dependent effect in distributing 0.5% bupivacaine cephaladally. The difference in density between cerebrospinal fluid and hyperbaric dextrose 0.8% local anaesthetic solution was greater in

pregnant women compared to non-pregnant women, which may have led to a more cephalic distribution[3].

The choice of the anaesthetic technique used should take into account the hemodynamic status of the patient at the time of presentation, the type of cardiac disease, previous use of drugs, and whether the surgery was elective or emergency. Regional anesthesia is contraindicated in patients with severe stenosis with hemodynamic instability, severe hypoxia, and the use of anticoagulants. Patients with NYHA class III and IV should not use spinal anesthesia because of the possible hemodynamic compromise. In hemodynamically stable patients, pure epidural anesthesia or low-dose combination epidural-spinal anesthesia according to some literature is recommended over general anesthesia. General anaesthetics are known to depress cardiac contractility, increasing pulmonary vascular resistance through positive pressure ventilation. Laryngoscopy and intubation and possible aspiration can also cause hemodynamic changes in patients undergoing general anesthesia. Preoperative management should involve multidisciplinary (involving cardiac, obstetrical, and pulmonary) to manage complications that may arise [2].

Until now, spinal anesthesia in patients with mitral stenosis is still contraindicated. This patient underwent spinal anesthesia by fulfilling the things that must be considered in anesthesia with mitral stenosis. It is by avoiding tachycardia, maintaining sinus rhythm conditions, and aggressively dealing with new occurrences of atrial fibrillation, avoiding a decrease in SVR, avoiding hypovolemia and fluid overload, and avoiding factors that cause increased pulmonary artery pressure. Previous studies concluded that low-dose spinal anesthesia did not cause hemodynamic changes and that fentanyl as an adjuvant had the effect of prolonging adequate analgesia and motor block so that in this patient we were anaesthetised with a dose of spinal anesthesia and there were no occurrences of hypotension or other hemodynamic changes[2].

CONSLUSION

The main principles of anesthesia in patients with mitral stenosis are avoiding tachycardia, maintaining sinus rhythm

and aggressively managing new occurrences of atrial fibrillation, avoiding a decrease in SVR, avoiding hypovolemia and fluid overload, and avoiding factors that can increase pulmonary artery pressure. In these patients, low-dose spinal anesthesia can be used as an alternative to anesthesia in patients with mitral stenosis because it is hemodynamically stable compared to conventional spinal anesthesia.

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