

# Anesthesia Management in a case of Patent Ductus Arteriosus with Eisenmengerisation undergoing a Caesarean Section

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## Abstract

Eisenmengers Syndrome consists of pulmonary hypertension and a right-to-left or bidirectional shunt with peripheral cyanosis. The shunt may be atrial, ventricular, or aortopulmonary. It is commonly found with left to right shunt reversal during end stages of PDA, VSD, and ASD. The presence of Eisenmengers syndrome places the pregnant patient at a high risk for maternal and neonatal mortality. The associated high pulmonary artery pressure with fixed vascular resistance are not reversed surgically. The prognosis of the same being dependent on the pulmonary hypertension. We discuss a case management of a primigravida with PDA and Eisenmengerisation in 28 weeks of gestation presenting with breathlessness.

## INTRODUCTION

In 1897 Victor Eisenmenger coined the term Eisenmenger complex which included large VSD and pulmonary hypertension. <sup>1</sup> Wood redefined this in 1958 as pulmonary hypertension with reversed or bidirectional shunt, associated with septal defects or patent ductus arteriosus.

Eisenmenger's syndrome is associated with high maternal mortality (30-36%) and high foetal wastage. <sup>2</sup> We describe successful management of a patient with this syndrome undergoing caesarean section.

## CASE REPORT

A 20 year old primigravida weighing 45kg in 27weeks of gestation presented with complaints of dyspnea on exertion. She had been hospitalized in the past for breathlessness and URTI at 8 years of age and was diagnosed case of Non cyanotic heart disease with PDA with left to right shunt. She was treated with Digoxin, Lasix and syrup Kesol. Now she was a registered ANC patient with regular check ups and Inj. Penidura prophylaxis taken. She was apparently alright for the first 20 weeks of pregnancy when she started feeling breathlessness and easy fatigability. Gradually the dyspnoea had progressed from Grade 1 to Grade 3 with bluish discolouration of toes. On examination, she had differential cyanosis and Grade 2 clubbing. There were no signs of raised JVP or pedal oedema. Auscultation of the chest revealed a Loud P2 and ejection systolic murmur at

pulmonary area. Systolic murmur in tricuspid area. ECG revealed right axis deviation and right ventricular hypertrophy.

The two dimensional echocardiography was called for and showed a large PDA measuring 7 mm and 10mm ampulla. Systolic Right to Left flow and minimal diastolic Left to Right flow with moderate to severe pulmonary hypertension and a bi-directional shunt. Pulmonary arterial systolic pressure (PASP)-120 mm Hg. Grade II-III TR. Mild RA ,RV dilatation, normal biventricular function. USG abdomen revealed IUGR. Patient was advised bed rest, oxygen therapy by ventimask and given digoxin 0.25 mg and T.lasix 40Mg OD. The patient progressively worsened as her pregnancy advanced and became dyspnoeic at rest. An elective caesarean section was therefore planned at 28 weeks.

Her haemoglobin was 14.6 gm% and haematocrit was 39.1% . Bleeding time (BT) 1min 15secs. Clotting time(CT) 3mins. Biochemistry was within normal limits. Arterial blood gas on room air revealed pH 7.45, PaO2 65mmHg, PaCO2 30 mmHg, SaO2 88%. She was premedicated with ranitidine 50 mg and metoclopramide 10 mg intravenously. Prophylactic antibiotics were given. On being taken to the OT, routine monitoring initiated included 3 lead ECG, SaO2, non-invasive blood pressure and hourly urine output. Under local anaesthesia, left radial artery and right cubital vein for CVP

monitoring were cannulated ; peripheral venous access with 18 G cannula taken on the left hand dorsum . Her baseline BP was 110/76, heart rate was 86/ min & CVP was 8 mmHg. Initial oxygen saturation on room air 88% improved to 96% with oxygen at 8 L/min through a facemask with partial rebreathing reservoir bag. Under all aseptic precautions, after local infiltration, an epidural catheter was passed at L2-L3 level by loss of resistance technique and was fixed at 10cms. After a test dose, 8 cc of 0.5% bupivacaine, 7 cc of 2% Lignocaine and 25 micrograms Fentanyl was given slowly. After 20 min, the upper level of block was T-8 (to touch). Further extra dural local anaesthetic top up was avoided, because the patient's BP had already fallen from 110/70 to 96/62 mmHg. Crystalloid intervention in the form of 300 ml Ringer lactate was given slowly to raise the CVP to 8 mmHg from 3 mmHg. Ephedrine 6 mg. was given IV as there was further drop in blood pressure to 84/58 mmHg. Central venous pressure was maintained around 8-10 mmHg. Arterial oxygen saturation was maintained above 95 % throughout the surgery. Caesarean section was performed and a female child weighing 2.6 kg was delivered. Apgar scores at 1 and 5 min were 3 and 7 respectively. After delivery of the child, 1 mg midazolam I.V was given, to relieve patient's anxiety. Methylergometrine bolus was avoided to avoid undesirable effects and oxytocin infusion was started slowly mantaining the haemodynamic parameters.

Post operatively, Fentanyl 25micrograms was given every 8 hours via epidural route for pain relief. She remained haemodynamically stable and her oxygen saturation was maintained above 95% while breathing oxygen by mask. A meticulous watch on her oxygen saturation was kept in order to avoid vulnerable pulmonary thromboemboism. Her CVP was maintained 8-10 mmHg. She improved gradually over next 5 days and sent home on the 20th postoperative day. On followup 4 weeks after discharge she was doing well.

**Figure 1**

Summary of haemodynamic changes:

| Time and event    | BP (mm of Hg) | Pulse (/ min) | CVP | Saturation (%) | Level of action |
|-------------------|---------------|---------------|-----|----------------|-----------------|
| Pre op-room air   | 110/76        | 86            | 8   | 88             | -               |
| Pre op-on 100% O2 | 110/76        | 88            | 8   | 96             | -               |
| Induction         | 100/76        | 100           | 6   | 96             |                 |
| After 10 min      | 96/62         | 104           | 5   | 96             | T10             |
| 20 min            | 90/60         | 106           | 5   | 97             | T8              |
| 30 min            | 84/58         | 98            | 3   | 98             | T8              |
| 40 min            | 88/60         | 116           | 6   | 97             | T8              |
| 50 min            | 90/62         | 104           | 7   | 97             | T8              |

**Figure 2**

Post operative haemodynamic status:

| Day | BP (mm of Hg) | Pulse(/ min) | CVP | Saturation(%)<br>On room air |
|-----|---------------|--------------|-----|------------------------------|
| 1   | 108/74        | 98           | 8   | 93                           |
| 5   | 110/76        | 96           | 6   | 96                           |
| 10  | 110/76        | 92           | 6   | 97                           |
| 20  | 118/80        | 80           | 7   | 97                           |

**DISCUSSION**

Because of the high mortality associated with Eisenmenger's syndrome, medical termination of pregnancy is the preferred management in these patients. However, if pregnancy is allowed to continue, strict bed rest & oxygen therapy are the hallmark of

successful outcome. The presence of fixed pulmonary hypertension not responding to oxygen therapy may perhaps be an absolute indication of the termination of pregnancy. If caesarean section has to be performed, it could be done either under general or regional

anaesthesia. 6 These patients however are high risk candidates for anaesthesia. Maintenance of preop levels of systemic vascular resistance is important as decrease in systemic vascular resistance, increases right to left shunt, decreases pulmonary perfusion and hypoxaemia. Decrease in CVP indicates decrease in Rt. heart filling which in the presence of fixed pulmonary artery hypertension decreases pulmonary perfusion and results in hypoxaemia. Hypotension from any cause can progress to insufficient Right ventricular pressure require to perfuse the hypertensive pulmonary arterial bed and may result in sudden death of the patient. 6 Catecholamine release especially during laryngoscopy and at extubation, causes increase in pulmonary vascular resistance in these patients. IPPV further increases pulmonary artery pressure and also causes fall in blood pressure. The net effect is an increase in the right to left shunt. However, general anaesthesia has been used successfully in these patients. 9 Regional anaesthesia may be a valuable option. However, precipitous changes in haemodynamics, which occur after single shot spinal anaesthesia, are undesirable. Incremental spinal anaesthesia has been used successfully in these patients. Cole PJ et al has mentioned this technique of ansthesia which is free from disadvantages of general anaesthesia and avoids invasive cardiac output monitoring due to the use of transthoracic bioimpedance cardiography. 3 A technique of Continuous Spinal anaesthesia has also been used by Sakuraba S et al. 4 This technique has also been used for management of caesarean section in a case of twin

pregnancy complicated with pulmonary hypertension. <sup>5</sup> Although technically difficult, this entitles for a reduced risk of sudden cardiovascular depression as compared to single-shot spinal and epidural anaesthesia technique. Epidural anaesthesia reduces the possibility of sudden change in haemodynamics. Titrated epidural anesthesia with incremental doses may be safe, appropriate and effective for these patients. <sup>6</sup> Ghai B et al have managed a multigravid female at 35 weeks of gestation with Eisenmengers syndrome with the use of titrated epidural anesthesia with 2% lidocaine. A slow induction of epidural anesthesia allows compensation for sympathectomy below the level of block. Oxygen must be administered to all patients undergoing surgery under regional anesthesia's oxygen reduces pulmonary vascular resistance. <sup>7</sup> Pain is known to increase the shunt, hence we chose the epidural catheter technique to provide intra and post op analgesia. Vigilant monitoring of ECG, pulse oximetry, invasive arterial blood pressure monitoring, central venous pressure, non-invasive cardiac output and urine output are recommended to manage such a case. We could not monitor cardiac output (non invasive) in our patient, as we did not have access to it. Pulse oximetry is the simplest way of assessing the degree of Rt to Lt shunt continuously. Oxytocin was not given as a bolus, as it causes direct vaso-dilatation and reduces SVR.

Thromboembolic phenomena are a well documented Complication. Our Patient did not develop this complication . In fact 43% of all maternal deaths in such patients are attributed to thromboembolism. <sup>8</sup> However, the post op monitoring is very important in these patients as majority of deaths occur in early post partum period, which are generally preceded by refractory hypoxaemia. Intense monitoring including direct arterial pressure, central venous pressure and oxygen saturation, ABG and maintenance of these

parameters as close to normal as possible, avoidance of hypoxia & hypotension, adequate management of post op pain and an early initiation of thromboprophylaxis are crucial for successful management of such cases

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