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A Case Series on Open Heart Surgery in Pregnant Patients: A Single Centre Experience. What Are the Key Takeaway Messages?

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Abstract **Case Report**

Conducting open-heart surgery during pregnancy is rare and involves significant risks to both mother and fetus. This case series explores the clinical course, management, and outcomes of two pregnant patients undergoing open-heart surgery in a single tertiary care center. Two cases were analyzed retrospectively. Case 1 involved a 25-year-old woman undergoing emergency aortic valve replacement for Stanford A aortic dissection at 27 weeks of gestation. Case 2 featured a 32-year-old patient with severe mitral stenosis and atrial fibrillation undergoing mitral valve replacement at 29 weeks. Both cases required cesarean delivery for fetal management. Both patients demonstrated favorable maternal outcomes, including stable cardiac function postoperatively. Case 1 experienced transient lung consolidation but was managed successfully. Both neonates, born prematurely, required respiratory support. However, they displayed steady progress throughout. Optimized timing, multidisciplinary management, and modified cardiopulmonary bypass protocols are important to improving outcomes. Despite challenges, advancements in surgical and neonatal care provide promising results for these complex cases.

Keywords: Case Series, Open-Heart Surgery, Pregnancy, Cardiopulmonary Bypass, Maternal-Fetal Outcomes.

INTRODUCTION

Open heart surgery in pregnant patients is an intricate procedure as there are several risks involved. It requires the balance between the mother's and the unborn child wellbeing. This kind of surgery is generally rare, however should the need arise, for example in cases of valvular heart disease, congenital malformation, and aortic dissections, the risks involved should be understood thoroughly. The specific challenges arise from the altered maternal and pregnancy physiological statuses such as increased blood volume, cardiac output and factors of blood viscosity, as well as possible changes in the metabolism and the distribution of drugs. These changes create a higher probability for complications in both the mother and fetus, including premature labor, fetal distress, and in extreme cases, intrauterine death. Hallmarks of open-heart surgery involving cardiopulmonary bypass (CPB). This usually add further risk since the manipulation of blood flow and temperature will have a significant impact on the fetus' welfare. Due to the use of hypothermia and hemodilution along with non-pulsatile flow during cardiopulmonary bypass, there is a risk of reducing the uteroplacental blood supply which can cause fetal distress or even miscarriage especially in the first trimester of the pregnancy. Therefore, this is the reason why we focus on two cases of pregnant women who have experienced open heart surgeries where this case report will enable us to understand what are the potential problems that we will have to face when managing pregnant mothers requiring open heart surgery.

Case Writeup:

Case 1:

A 25-year-old female with a history of pulmonary tuberculosis (PTB) underwent urgent aortic valve replacement (AVR) with inter-position graft for Stanford a aortic dissection at 27+3 weeks of gestation. Her presenting symptoms were sudden onset of chest pain and shortness of breath. There was no malperfusion syndrome. She also required an emergency cesarean section (EMLSCS) for maternal stabilization at the same setting. Post-operatively, she developed mediastinal blood clots, necessitating chest washout. Her management included ventilation support, with extubation and subsequent weaning to room air. Blood pressure was controlled with antihypertensive medications, and she received prophylactic antibiotics

and low-molecular weight heparin postpartum. Patient was discharged home well on Day 16. Cardiovascular recovery was uneventful, with the patient well and having good left ventricular function (EF 65%) with no other complications during follow-up two months post-operatively. The baby, born at 27 weeks and 2 days, and at 77 days of life is currently stable under CPAP with mild respiratory distress, progressing well with feeding, and showing good growth, despite a history of prematurity, anemia and bronchopulmonary dysplasia (BPD).

Image 1: CT scan showing dissection

Case 2:

A 32-year-old pregnant woman with severe mitral stenosis (MS) and atrial fibrillation (AF), was initially managed for cardiogenic shock. Due to her cardiovascular condition, she then underwent mitral valve replacement (MVR) with a mechanical valve and cesarean section (CS) at 29 weeks of pregnancy. Post-op recovery has been smooth, with good biventricular function, stable vitals, and no significant complications, and was discharged home well on Day 10. Current management includes warfarin, bisoprolol, and diuretics, with follow-up scheduled for further monitoring of her cardiac and maternal status. She was noted to be well during her two months follow-up post-operatively. The baby, born prematurely at 29 weeks and 3 days with a birth weight of 1.4kg, was in stable condition till Day 15 of life. Issues included prematurity, apnea of prematurity, and a tiny PDA, with an otherwise balanced heart. At 6 weeks follow up, the mother and child are thriving well. Latest follow up for the child at 12 weeks shows the child is growing well.

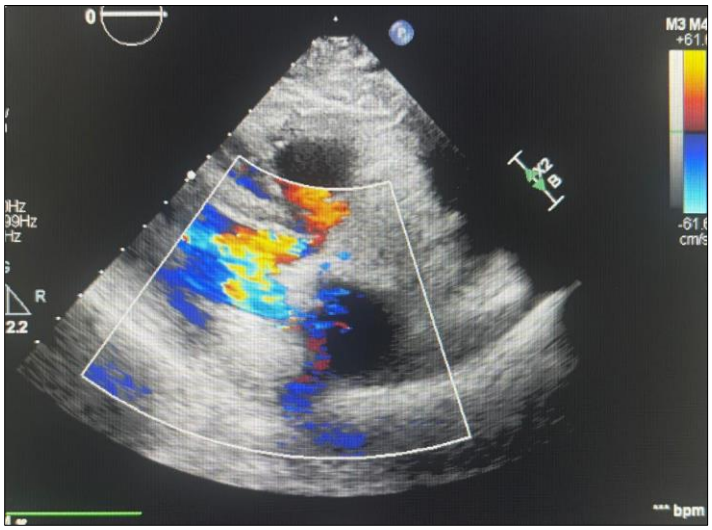

Image 2: ECHO showing severe mitral stenosis

DISCUSSION

Elective cardiovascular procedures have a maternal mortality rate of 6%, but emergency procedures with complications like acute decompensation from prosthetic valve thrombosis or critical aortic stenosis make surgery difficult with higher mortality and morbidity [1]. Case 1 was conducted in an urgent setting due to the acute nature of the disease. Weiss *et al*., showed that emergency and scheduled operations have different outcomes. Emergency procedures often lack planning, increasing bleeding, arrhythmias, and other dangers [2]. Long-term follow-up for mother and child is essential, especially in cases of prolonged CPB periods or maternal hemodynamic instability [3].

Open-heart surgery has fetal death rates of 9%–30%, especially in the first trimester [2]. Long bypass times, maternal hemodynamic instability, and other factors worsen placental insufficiency [2]. Neonates exposed to maternal CPB commonly develop preterm, low birth weight, and respiratory distress syndrome. Despite prolonged NICU stay, both babies in this case series recovered and are currently thriving well.

Surgery in the second trimester has the best maternal-fetal results. Organogenesis is complete, minimizing the fetus's teratogenic risk and avoiding third-trimester interventions and preterm labor hazards. Due to teratogenic drugs and placental hypoperfusion, first-trimester procedures have the highest fetal fatality rates. Because of urgent maternal circumstances, third-trimester procedures often necessitate prior delivery to preserve the fetus [5]. Both patients that underwent open heart surgery in our centre underwent Caesarean section during the same setting of surgery during the third trimester. We believe that this is an ideal time as we have passed the initial period of organogenesis but despite this, being born preterm has its own set of challenges.

Optimizing cardiopulmonary bypass (CPB) parameters intraoperatively protects mothers and babies. High-flow, high-pressure CPB, normothermic conditions, and continuous fetal monitoring are recommended to improve uteroplacental blood flow and reduce fetal risks. Pulsatile perfusion may be beneficial, though evidence is mixed [6]. Despite reports showing the advantages of normothermia, our centre still practices hypothermia as per standard practice for better organ protection. However, in the future we believe that a change in CPB conduct, for example normothermia may show superior benefit.

Open-heart surgery during pregnancy is complicated and high-risk, requiring a multidisciplinary approach to achieve optimal outcomes for mother and fetus. Preoperative risk assessment and counselling are crucial for women with cardiac problems considering pregnancy [4]. Multidisciplinary collaboration is consistently emphasized in our centre as critical for optimizing outcomes in maternal cardiac surgeries during pregnancy. Early risk identification and detailed counselling to help patients understand potential consequences and outcomes and help healthcare providers create a coordinated treatment plan.

Anticoagulation techniques are crucial in prosthetic heart valves and other thromboembolic patients. Heparin over oral anticoagulants during pregnancy is recommended since it minimizes fetal risks without sacrificing maternal safety. During pregnancy and surgery, dosages must be monitored and adjusted to prevent maternal thrombosis and fetal problems [7]. Anticoagulation was not an issue to us as the child was delivered during the same setting. Patient in Case 2 required usage of warfarin post-operatively as she received a mechanical valve.

Postoperative care is crucial. Neonates exposed to maternal CPB commonly develop preterm, low birth weight, and respiratory distress syndrome, requiring specialist treatment in neonatal critical care units. The mother must be closely monitored after surgery to detect and treat arrhythmias, hemorrhage, and thromboembolic events. Long-term follow-up for mother and child is essential, especially in cases of prolonged CPB periods or maternal hemodynamic instability. The children from both cases were treated in the NICU in the immediate post-op period. Despite prolonged NICU stay, they both recovered well and are currently thriving well.

CONCLUSION

In conclusion, early risk identification, coordinated planning, and meticulous intraoperative and postoperative measures are essential for successful open-heart surgery during pregnancy. This involves preoperative counseling to align patient and provider expectations, precise surgical and anesthetic techniques to reduce risks, and coordinated postoperative care to enhance recovery. A comprehensive approach validated by many studies is necessary to navigate this high-stakes medical setting and improve mother and fetal outcomes.

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Declarations:

1. Declaration of Conflicting Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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3. Ethical Approval and Informed Consent Statements

No ethical approval was obtained as this is a retrospective review. No picture or identity of the patient was revealed

4. Data Availability Statement

Data supporting the findings of this study are available upon request from the corresponding author.

5. Author Contributions

All authors contributed equally to the research, drafting, and final approval of this manuscript.

Gurpreet Singh- Main author, preparing manuscript

Nakhieeren Nallasamy- Literature review, writing up cases

Mohd Firdaus Abd Rahman- Checking of manuscript and proving ideas for discussion

Thomas Francis- Checking of manuscript and providing ideas for the discussion section

Hamzah Kamarulzaman- Checking and editing the manscript

Mohamad Arif Muhammad Nor- Primary surgeon for both cases, editing the manuscript and provided valuable input

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