DOI: 10.7860/JCDR/2026/81825.23457

Case Series

Anaesthesia Section

Individualised Anaesthetic Strategies for High-risk Cardiac Parturient: A Case Series

ROCHANA G BAKHSHI[1], MONA S JADHAV[2], SAKSHI KHATRI[3], MEGHANA CHOWDHARY[4]

ABSTRACT

Cardiac disease in pregnancy is a significant contributor to maternal morbidity and mortality worldwide. Physiological changes of pregnancy including increased cardiac output, expanded blood volume, tachycardia, and decreased Systemic Vascular Resistance (SVR) place additional stress on the cardiovascular system. These changes may unmask previously asymptomatic cardiac abnormalities or worsen pre-existing disease. The management of pregnant women with underlying cardiac conditions poses a unique perioperative and obstetric challenge, requiring multidisciplinary coordination to maintain maternal and foetal stability. Here, the authors, present a series of four clinically distinct and rare cardiac conditions encountered during pregnancy, each demonstrating different mechanisms of haemodynamic compromise. The first case involved rheumatic mitral stenosis of a 26-year-old gravida, where increased circulatory demand precipitated pulmonary congestion and heightened risk of decompensated heart failure. The second case in a 32-year-old gravida, featured Partial Anomalous Pulmonary Venous Connection (PAPVC) with sinus venosus defect, a congenital anomaly infrequently detected during pregnancy due to its subtle symptom profile. The third case in 36-year-old primigravida was unique due to the coexistence of Coronavirus Disease 2019 (COVID-19) infection and acute myocardial infarction during the second trimester - a rare combination associated with a three to four-fold increased risk of infarction in pregnancy. The fourth case in a 38-year-old gravida 2, involved an Atrial Septal Defect (ASD) complicated by anaemia and beta-thalassaemia trait, where the additive effects of hypervolaemia and reduced oxygen-carrying capacity intensified right-sided volume overload. Each case required individualised management emphasising pharmacological optimisation, vigilant haemodynamic monitoring, and careful peripartum planning. The present case series highlights the importance of early recognition, risk stratification, and multidisciplinary care for achieving favourable maternal and foetal outcomes in pregnant patients with complex cardiac disease.

Keywords: Cardiac disease, Mitral stenosis, Myocardial infarction, Partial anomalous Pulmonary venous connection, Pregnancy

INTRODUCTION

The management of pregnant patients with cardiac disease presents a significant challenge to both obstetricians and anaesthesiologists due to the complex physiological changes that accompany pregnancy. Haemodynamic adaptations such as increased cardiac output, expanded plasma volume, and pregnancy-induced tachycardia may unmask previously asymptomatic cardiac lesions or exacerbate pre-existing disease during the second and third trimesters. Maternal risk during pregnancy is multifactorial and is influenced by the underlying cardiac pathology, the degree of functional limitation as assessed by the New York Heart Association (NYHA) classification, and associated complications including anaemia, infection, arrhythmias, haemorrhage, and thromboembolic events. Reported maternal mortality varies considerably, ranging from approximately 0.4% in patients with NYHA Class I-II disease to nearly 6.8% in those with Class III-IV disease. Management requires a thorough understanding of cardiovascular physiology, risk stratification, and meticulous peripartum planning with multidisciplinary involvement. The present case series describes four pregnant women with distinct congenital and acquired cardiac disorders, each highlighting unique perioperative and anaesthetic challenges. Early recognition, intensive monitoring, and individualised management are crucial to ensuring favourable maternal and foetal outcomes in such high-risk pregnancies [1].

CASE SERIES

Case 1

A 26-year-old gravida at 36 weeks of gestation, a known case of rheumatic heart disease with mitral stenosis and mitral regurgitation for the past eight years, and hypothyroidism for three years on Tab. Thyronorm 100 mcg daily, presented with symptoms of congestive cardiac failure. On admission, the patient had tachypnoea with a respiratory rate of 28 breaths/min, coarse basal crepitations on auscultation, and mild pedal oedema. She had undergone balloon mitral valvuloplasty five years earlier and was on blood thinners, penicillin prophylaxis 1g, and beta blockers Tab. Metoprolol 12.5 mg.

A Two-dimensional (2D) echocardiogram revealed moderate mitral regurgitation, mitral valve area of 1.2 cm^2, mean trans-valvular gradient of 8 mmHg, Pulmonary Artery Systolic Pressure (PASP) 57 mmHg, and dilated left atrium without clots. Her Mini-Mental State Examination (MMSE) score was 30/30, indicating normal sensorium. She was admitted to the ICU and managed with oxygen supplementation, intravenous furosemide 40 mg, and fluid restriction [2].

Once optimised, she was planned for an emergency Lower Segment Caesarean Section (LSCS) after 48 hours. Preoperative vitals showed Heart Rate (HR) 72/min, Blood Pressure (BP) 130/82 mmHg, and Oxygen Saturation (SpO_2) 99% on oxygen by face mask. A combined spinal-epidural anaesthesia technique was used. Intrathecal 0.5% hyperbaric bupivacaine 1.4 mL with fentanyl 20 µg was administered achieving T10 level; an additional 2 mL of 2% preservative-free lignocaine epidurally raised the block to T5.

A healthy neonate was delivered within seven minutes of incision. Oxytocin 20 International Unit (IU) diluted in 500 mL Ringer Lactate (RL) was administered slowly to avoid fluid overload. Immediately after placental delivery, the patient developed dyspnoea with basal crepitations despite stable haemodynamics and was given i.v.

furosemide 40 mg. The total intraoperative fluid was 500 mL, urine output 450 mL, and estimated blood loss 600 mL.

Case 2

A 32-year-old woman, gravida 2 para 1 living 1, at 38 weeks of gestation presented in active labour with oligohydramnios and was scheduled for emergency LSCS. She had no history of palpitations, dyspnoea, orthopnoea, chest pain, or syncopal episodes. Her previous pregnancy and delivery were uneventful.

On general examination, her pulse was 90 beats/min and regular, and BP was 124/80 mmHg. Bilateral pitting pedal oedema was present. Auscultation of the chest revealed bilateral fine crepitations in the lower lung fields. Electrocardiogram (ECG) showed Right Bundle Branch Block (RBBB) with right ventricular hypertrophy. The 2D echocardiography demonstrated a preserved Left Ventricular Ejection Fraction (LVEF) of 55%, dilated Right Atrium (RA) and Right Ventricle (RV), moderate Tricuspid Regurgitation (TR), and PASP of 65 mmHg, indicating moderate to severe pulmonary hypertension. No valvular abnormalities, intracardiac clots, or vegetations were detected [3]. Arterial Blood Gas (ABG) analysis reported pH-7.459, Partial Pressure of Carbon Dioxide in Arterial Blood ($PaCO_2$)-33.1 mmHg, Partial Pressure of oxygen (PaO_2)-78.8 mmHg, and Bicarbonate (HCO_3)-24 mmol/L, suggestive of mild respiratory alkalosis with borderline oxygenation.

The patient was counselled about the increased risk of cardiac complications during delivery, and high-risk consent was obtained from the relatives. Intensive Care Unit (ICU) bed with ventilatory support backup and blood products were kept ready preoperatively. Considering the presence of significant pulmonary hypertension and potential for right ventricular decompensation, general anaesthesia was planned and administered. Guarded fluid therapy to avoid fluid overload was given, oxytocin 20 IU in 500 mL Normal Saline (NS) slowly and carbetocin 100 mcg Intravenous (i.v.) as requested by the obstetrician for better uterine contraction. There was a subsequent fall in BP hence Noradrenaline (4mg/50 mL of normal saline 0.9%) started @ 2 mL/hr and was slowly tapered as per BP. Intraoperative blood loss was 700 mL, and a total fluid of 700 mL (crystalloid 500mL + colloid 200 mL) was given. Injection furosemide 20 mg was given. Towards the end of surgery, coarse crepitations were heard over the chest, the patient was electively ventilated in the ICU, weaned off the next day, and extubated. Cardiac Computed Tomography (CT) angiography showed moderate cardiomegaly, dilatation of the main pulmonary artery and its right and left branches measuring 42mm, 30.7mm, and 24mm, suggestive of pulmonary hypertension. The right superior pulmonary vein was draining into the right superior vena cava with a suspicious sinus venosus defect suggestive of PAPVC. The cardiologist advised medical management presently and cardiac catheterisation study after six weeks postpartum. After one week of hospital stay, she was discharged.

Case 3

A 36-year-old primigravida at 36 weeks of gestation was scheduled for an elective LSCS. Three months prior, she had been hospitalised in a private facility with an acute choking sensation and subsequently tested positive for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection. Chest radiography showed patchy opacities, and she was diagnosed with an acute myocardial infarction. She was managed in the ICU with high-flow nasal oxygen and conservative medical therapy, though detailed records were unavailable. The chest opacities resolved by the fifth day of illness.

She was a known case of gestational diabetes mellitus and chronic hypertension since the 3rd month of pregnancy, receiving oral glycomet 500 mg thrice daily, amlodipine 5 mg, labetalol 100 mg, and furosemide 40 mg once daily. She was also on aspirin 75 mg, clopidogrel 75 mg, and rosuvastatin 20 mg, and antiplatelet agents had been withheld for five days prior to surgery. Preoperative Electrocardiography (ECG) showed features of an old anterior wall myocardial infarction with left ventricular hypertrophy. Two-dimensional echocardiography demonstrated severe apical and septal hypokinesia with a LVEF of 45% and Grade II diastolic dysfunction [4].

On the day of surgery, she received her antihypertensive medications amlodipine 5 mg, labetalol 100 mg, and furosemide 40 mg. High-risk informed consent was obtained in view of recent myocardial ischemia. After standard monitoring and invasive arterial line placement, spinal anaesthesia was administered using 1.8 mL of 0.5% hyperbaric bupivacaine with fentanyl 15 µg, achieving a T6 sensory level. Intraoperatively, HR and BP remained stable, supported with intermittent ephedrine boluses (total 12 mg) and minimal crystalloid administration (250 mL). A bilateral ultrasound-guided transversus abdominis plane block was performed with 0.2% ropivacaine 20 mL per side for postoperative analgesia. The surgery lasted one hour, and the patient had an uneventful postoperative recovery.

Case 4

A 38-year-old gravida 2, with a previous LSCS was one year prior, was scheduled for an elective repeat LSCS. She was a diagnosed case of a moderate-sized ASD since eight years ago, anaemia, and beta-thalassaemia trait. Echocardiographic assessment had revealed an aneurysmal Interatrial Septum (IAS) with a multifenestrated moderate ASD causing a left-to-right shunt. Despite these findings, she remained asymptomatic and had undergone an uneventful caesarean delivery eight years earlier.

On preoperative examination, she was conscious, well-oriented, and afebrile. Her pulse rate was 90 beats/minute, BP was 120/80 mmHg, and SpO_2 was normal on room air. Respiratory examination was unremarkable. Two-dimensional Echocardiography (2D echo) showed a LVEF of 55%, dilated RA and RV, mild TR, PASP of 46 mmHg indicating moderate pulmonary hypertension, a 23 mm ostium secundum ASD, and a D-shaped Left Ventricle (LV) suggestive of pressure overload. Routine laboratory test results were within normal limits.

On the day of surgery, her vital parameters remained stable with a HR of 92 beats/min and BP of 130/80 mmHg. ECG showed a RBBB. Spinal anaesthesia was administered using 1.8 mL of 0.5% hyperbaric bupivacaine with fentanyl 10 µg, achieving a thoracic level 6 (T6) sensory block. Intraoperatively, haemodynamics were stable throughout the one-hour procedure with an infusion of 550 mL RL. The perioperative course remained uneventful.

A comparison of the clinical presentation, anaesthetic management, and outcomes of these four cases is summarised in [Table/Fig-1].

DISCUSSION

Pregnant patients with underlying cardiac disease are at an increased risk of cardiac decompensation due to the physiological rise in blood volume, cardiac output, and oxygen demand that accompanies pregnancy and parturition. This increased haemodynamic stress may unmask previously compensated cardiac lesions or worsen pre-existing pathology.

The first patient presented with moderate mitral stenosis and regurgitation and baseline dyspnoea that progressed to signs of congestive cardiac failure in the late third trimester. With timely diagnosis and medical optimisation including beta-blocker therapy and restriction of activity, she remained in sinus rhythm and successfully tolerated pregnancy and delivery. In such cases, carefully titrated neuraxial anaesthesia with incremental dosing and invasive arterial pressure monitoring may help maintain stable haemodynamics during labour and delivery.

Partial Anomalous Pulmonary Venous Connection (PAPVC) is a rare congenital abnormality in which one or more pulmonary veins

Case	Age, weeks of pregnancy	Cardiac diagnosis and key findings	Anaesthetic strategy	Major challenges and perioperative considerations	Outcome
Case 1	26-year-old woman gravida at 36 weeks of gestation	Mitral stenosis with moderate mitral regurgitation; Pulmonary Artery Systolic Pressure (PASP) 57 mmHg; congestive cardiac failure in late pregnancy	Combined spinal-epidural with incremental dosing; invasive monitoring; fluid restriction	Preventing pulmonary oedema; maintaining sinus rhythm and adequate preload; avoiding abrupt ↓ Systemic Vascular Resistance (SVR)	Required postoperative non-invasive ventilation and diuretics; stable recovery and discharge
Case 2	32-year-old woman, gravida 2 para 1 living 1, at 38 weeks of gestation	Undiagnosed Partial Anomalous Pulmonary Venous Connection (PAPVC); severe Pulmonary Arterial Hypertension (PAH); right ventricular hypertrophy	General anaesthesia due to emergency status; ICU support planned	Avoiding rise in Pulmonary Vascular Resistance (PVR); managing pulmonary oedema post-delivery; rapid stabilisation	Developed pulmonary oedema intra-partum but responded well; discharged
Case 3	36-year-old woman primigravida at 36 weeks of gestation	Recent COVID-19 infection with acute myocardial infarction; Ejection Fraction (EF)- 45%; Grade II diastolic dysfunction	Low-dose spinal anaesthesia with invasive arterial monitoring; ultrasound-guided Transversus Abdominis Plane (TAP) block for analgesia	Avoiding hypotension and tachycardia; balancing anticoagulation; preventing myocardial ischemia	Haemodynamically stable; uneventful postoperative recovery
Case 4	38-year-old woman gravida 2, with a previous LSCS	Moderate ostium secundum Atrial Septal Defect (ASD); moderate pulmonary hypertension; anaemia with β-thalassaemia trait	Spinal anaesthesia; strict haemodynamic monitoring	Avoiding ↓ SVR and ↑ PVR; ensuring adequate oxygen delivery; risk of dysrhythmias	Stable throughout and after surgery; uneventful recovery

[Table/Fig-1]: Comparison of case presentation, anaesthetic management and outcomes in four pregnant patients with cardiac disease.

drain into the RA or a systemic venous tributary instead of the left atrium. It frequently co-exists with ASD, thereby exacerbating left-to-right shunting. Chronic pulmonary overcirculation may ultimately progress to Pulmonary Arterial Hypertension (PAH) and right heart failure. The second patient, with undiagnosed right-sided PAPVR until emergency presentation for caesarean delivery, exhibited signs of severe PAH on preoperative transthoracic echocardiography. General anaesthesia was chosen due to limited diagnostic information and urgency. Although predictable pulmonary oedema developed following delivery, it was effectively treated, and recovery was uneventful [5].

SARS-CoV-2 infection has been associated with diverse cardiovascular complications including acute coronary syndromes, myocarditis, arrhythmias, and stress cardiomyopathy. Acute myocardial injury- identified by elevated cardiac troponin levels and supportive clinical changes is the most common presentation. Mechanisms include cytokine-induced inflammation, endothelial dysfunction, coronary thrombosis, and hypoxemia-induced supply-demand mismatch. The third patient experienced a COVID-19 associated acute myocardial infarction earlier in pregnancy, with residual left ventricular dysfunction and grade II diastolic impairment on echocardiography. With adequate preoperative assessment and haemodynamic monitoring, spinal anaesthesia with a low dose of hyperbaric bupivacaine and fentanyl was safely administered, maintaining cardiovascular stability. In patients with ASD, perioperative goals focus on optimising oxygenation and maintaining a balance between pulmonary and systemic blood flow [6]. Stable SVR, PVR, HR, and myocardial function help reduce the risk of reversal of shunt flow or dysrhythmias. In our fourth patient with moderate-sized ASD and pulmonary hypertension, spinal anaesthesia using ropivacaine and fentanyl provided adequate anaesthesia with minimal haemodynamic alterations, ensuring a stable perioperative course.

CONCLUSION(S)

Pregnancy can unmask or exacerbate previously asymptomatic or compensated cardiac lesions, placing both mother and fetus at risk. Careful preoperative evaluation, multidisciplinary planning, and individualised anaesthetic strategies are essential to optimise outcomes. Both general and regional anaesthesia can be safely used when tailored to the patient's specific cardiac pathology, haemodynamic status, and urgency of delivery. Continuous haemodynamic monitoring, judicious fluid management, and prompt recognition of complications such as pulmonary oedema or arrhythmias are critical for perioperative safety. The present case series reinforces that vigilant perioperative care allows successful maternal and foetal outcomes even in complex cardiac conditions.

REFERENCES

[1] Gangakhedkar GR, Kulkarni AP. Physiological changes in pregnancy. Indian J Crit Care Med. 2021;25(Suppl 3):S189-S192. Doi: 10.5005/jp-journals-10071-24039.
[2] Tsiaras S, Poppas A. Mitral valve disease in pregnancy: Outcomes and management. Obstet Med. 2009;2(1):6-10.
[3] Olsen R, Doyle Z, Levy D, Anton T, Molkara D, Tarsa M, et al. Anomalous pulmonary venous return: Insights into prenatal detection. J Ultrasound Med. 2016;35(6):1193-206. Doi: 10.7863/ultra.15.04041.
[4] Capaccione KM, Leb JS, D'souza B, Utukuri P, Salvatore MM. Acute myocardial infarction secondary to COVID-19 infection: A case report and review of the literature. Clin Imaging. 2021;72:178-82.
[5] Afify H, Kong A, Bernal J, Elgendy IY. Pulmonary hypertension in pregnancy: Challenges and solutions. Integr Blood Press Control. 2022;15:33-41. Doi: 10.2147/IBPC.S242242.
[6] Bredy C, Mongeon FP, Leduc L, Dore A, Khairy P. Pregnancy in adults with repaired/unrepaired atrial septal defect. J Thorac Dis. 2018;10(Suppl 24):S2945-S2952.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of Anaesthesia, Padmashree DY Patil School of Medicine, Navi Mumbai, Mumbai, Maharashtra, India.
2. Professor, Department of Anaesthesia, Padmashree DY Patil School of Medicine, Navi Mumbai, Mumbai, Maharashtra, India.
3. Junior resident, Department of Anaesthesia, Padmashree DY Patil School of Medicine, Navi Mumbai, Mumbai, Maharashtra, India.
4. Consultant, Department of Anaesthesia, Medicover Hospital, Khargar, Mumbai, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Sakshi Khatri,
Junior resident, Department of Anaesthesia, Padmashree DY Patil School of Medicine, Navi Mumbai, Mumbai, Maharashtra, India.
E-mail: sakshi07sep@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jul 14, 2025
- Manual Googling: Feb 03, 2026
- iThenticate Software: Feb 06, 2026 (1%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Jul 07, 2025**
Date of Peer Review: **Oct 20, 2025**
Date of Acceptance: **Feb 09, 2026**
Date of Publishing: **May 01, 2026**