International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Case Report: Anaesthetic management in Balloon Coarctoplasty in a 2 Month Old Infant with Coarctation of Aorta and Dilated Cardiomyopathy

Dr. Hasanah Ali[1], Dr. Jessy Vennel[2]

[1]Junior Resident, Department of Anaesthesiology, MGM Medical College, Navi Mumbai
Email: *Hasanahali6[at]gmail.com*

[2]Professor and Head, Department of Anaesthesiology, MGM Medical College, Navi Mumbai (Corresponding Author)

Abstract: ***Coarctation of the aorta is a congenital narrowing of the descending aorta that can present early in infancy with heart failure and systemic hypoperfusion. We report the case of a 2-month-old, 3-kg infant diagnosed with coarctation of the aorta associated with dilated cardiomyopathy, who presented with bilateral pedal edema. Clinical evaluation revealed significant upper–lower limb blood pressure and oxygen saturation gradients with feeble femoral pulses. Echocardiography demonstrated coarctation of the aorta with bicuspid aortic valve, small patent ductus arteriosus, global left ventricular hypokinesia, and reduced systolic function. CT aortography confirmed severe narrowing of the descending thoracic aorta distal to the left subclavian artery. The child underwent balloon coarctoplasty under general anaesthesia. Serial balloon dilatation resulted in a marked reduction in the peak systolic gradient from 50 mmHg to 19 mmHg, with immediate improvement in lower limb perfusion, blood pressure, and oxygen saturation. The procedure was uneventful from an anaesthetic standpoint. This case highlights the importance of early diagnosis, meticulous anaesthetic management, and timely catheter-based intervention in infants with coarctation of the aorta complicated by ventricular dysfunction, leading to favourable immediate hemodynamic outcomes.***

Keywords: Coarctation of Aorta, Infantile Coarctation, Dilated Cardiomyopathy, Balloon Coarctoplasty, Congenital Heart Disease, Pediatric Cardiac Anaesthesia, Interventional Cardiology, Left Ventricular Dysfunction, Upper–Lower Limb Blood Pressure Gradient, Neonatal Anaesthesia

1. Introduction

Coarctation of the aorta (CoA) is a congenital narrowing of the aorta,occurring anywhere from distal part of arch of aorta to bifurcation of abdominal aorta, but is commonly located immediately below the origin of the left subclavian artery. This narrowing leads to significant hemodynamic changes including upper body hypertension, diminished femoral pulses, and lower body hypoperfusion. If left untreated, it can result in left ventricular hypertrophy, heart failure, and even death in infancy. CoA can present with a variety of clinical symptoms, especially in neonates, including feeding difficulties, respiratory distress, and failure to thrive. Balloon coarctoplasty has become an important minimally invasive therapeutic option for selected cases in infants and children.

Patient Information
- Name: Hiranya Pawar
- Age: 2 months
- Weight: 3 kg
- Sex : Female
- Diagnosis: Coarctation of Aorta with Dilated Cardiomyopathy

History of Present Illness
- The child presented with a history of bilateral pedal edema.
- Failure to thrive

Birth History
- Full-term delivery via Lower Segment Cesarean Section (LSCS) due to non-progression of labour
- History of neonatal jaundice.
- History of NICU admission for 3 days for neonatal pneumonia
- Immunised as per age

Preoperative Assessment

a) Medication:
- Tablet Furosemide + Spironolactone (20/50) diluted in 5 ml normal saline, given 0.3 ml twice daily.

b) Vital Signs:
- Pulse: 120 bpm
- Respiratory Rate: 42/min
- SpO2: Upper limbs – 99% on room air; Lower limbs – 80% on room air

c) Blood Pressure:
- Left Upper Limb: 99/70 mmHg
- Right Upper Limb: 99/84 mmHg
- Left Lower Limb: 54/40 mmHg
- Right Lower Limb: 50/38 mmHg

d) Femoral Pulses: Feeble

Systemic Examination:
- Respiratory System: AEBE
- Cardiovascular System: S1S2 +, No murmurs.
- Central Nervous System: Conscious and alert

Investigations
- Haemoglobin: 10.4 g/dL
- PT/INR: 17.10 sec / 1.462
- Troponin I: 181.8 ng/L (Elevated; normal 0–11 ng/L)
- ProBNP: >30,000 pg/mL (Severely elevated)

- CPK-MB: 5.45 ng/mL (Elevated; normal 0–0.38 ng/mL)

2D Echocardiography (24/04/2025):
- Bicuspid Aortic Valve
- Small PDA (3 mm) with Left-to-Right shunt
- Global LV Hypokinesia
- Reduced LV Systolic Function 25%
- Coarctation of aorta noted after subclavian artery in descending aorta.
- Peak gradient across Coarctation is 50mmHg respectively .
- Grade I Tricuspid Regurgitation
- Mild Pulmonary Arterial Hypertension (PAH)

CT Aortogram (25/04/2025):
- Narrowing of descending thoracic aorta ~2.6 mm in diameter, located 2.8 mm distal to the left subclavian artery
- Proximal aortic dilatation suggestive of coarctation.
- There is mild post stenotic dilatation of the descending aorta.
- There is mild circumferential narrowing of the aortic arch distal to the origin of the left subclavian artery. Arch of aorta measures 7.1 mm
- Ascending aorta measures 11.0 mm
- Descending thoracic aorta measures 8.9 mm
- Moderate cardiomegaly with left ventricular enlargement is noted.
- Upper abdominal aorta measures 5.6 mm
- At the level renal arteries abdominal aorta measures 4.4 mm
- Infrarenal segment of abdominal aorta measures 4.2 mm
- Bilateral common iliac arteries measures 2.0 mm

Anaesthetic Management

Anaesthetic Management was carefully planned and executed, considering the patient's critical cardiac status and age-related physiological considerations.

Pre-Anaesthetic Considerations:
- Age and Weight: Neonate (2 months, 3 kg), requiring precise drug dosing and thermal regulation.
- Cardiac Status: Severe Coarctation of Aorta with Dilated Cardiomyopathy, elevated ProBNP and troponin, reduced LV function. These factors increased the risk of intraoperative hemodynamic instability.
- Perfusion Imbalance: Marked difference in preoperative upper vs. lower limb BP and SpO2 indicated significant systemic outflow obstruction.
- Airway Assessment: Not assessable preoperatively; standard difficult airway precautions taken.

Induction

1) Intravenous access was secured prior to induction.
2) Induction Agents :
- Midazolam – used for sedation
- Fentanyl- opioid analgesic, carefully titrated to reduce sympathetic response
- Propofol- for smooth induction; cautiously dosed due to risk of hypotension
- Atracurium – neuromuscular blocker for intubation

All medications were dosed according to weight (3 kg) with attention to cardiovascular effects.

Airway Management:
- Intubation: Performed under direct laryngoscopy using Miller's blade size 1
- Endotracheal Tube (ETT): 3.0 mm uncuffed tube, appropriate for age and weight
- Successful intubation with minimal trauma, ensuring secure airway for the duration of the interventional procedure.

Maintenance of Anaesthesia:
1) Anaesthesia was maintained with a combination of:
   - Oxygen and air mixture to avoid hyperoxia or hypoxia
   - Sevoflurane, an inhalational agent favored for its rapid onset and cardiovascular stability
2) Ventilation was carefully controlled via JR circuit to maintain normocapnia and optimize oxygen delivery without compromising venous return or exacerbating pulmonary pressures.

Intraoperative Monitoring and Management:
1) Continuous monitoring included:
   - ECG
   - Non-invasive blood pressure from all four limbs (pre- and post-dilation)
   - Pulse oximetry (upper and lower limbs)
   - Capnography
2) Careful observation for changes in heart rate, blood pressure, and saturation during balloon inflation was crucial.
3) Vasopressor/inotrope support was kept ready but not immediately required due to stable intraoperative hemodynamics post-gradient reduction.

Postoperative Considerations:
- The patient remained hemodynamically stable following the procedure.
- Gradual weaning from anaesthesia and extubation were considered once full respiratory effort and hemodynamic stability were ensured.
- Close monitoring in a paediatric cardiac ICU setup was arranged to manage potential complications like re-coarctation, arrhythmias, or heart failure exacerbation.

Procedure Description:
- Procedure: Balloon Coarctoplasty

A standard J-tip 0.035x260 wire was introduced and positioned at the coarctation site. Under fluoroscopic guidance, serial balloon dilatations were performed at increasing pressures (8 atm followed by 14 atm). Post-dilation, the pressure gradient across the coarctation reduced significantly, with improved lower limb saturations and blood pressure.

Hemodynamic Results
- Pre-Dilation Peak Gradient: 50 mmHg
- Post-Dilation Peak Gradient: 19 mmHg

Blood Pressure Readings:

a) Pre-Procedure:
- Upper limbs: Right – 99/74 mmHg; Left – 99/80 mmHg
- Lower limbs: Right – 50/38 mmHg; Left – 54/40 mmHg

b) Post-Procedure:
- Upper limbs: Right – 118/58 (MAP 72); Left – 96/48 (MAP 58) mmHg
- Lower limbs: Right – 82/52 (MAP 58); Left – 96/78 (MAP 82) mmHg

2. Discussion

This case highlights the critical presentation of a neonate with Coarctation of the Aorta complicated by Dilated Cardiomyopathy. The elevated troponin and ProBNP levels indicated significant myocardial strain. Balloon coarctoplasty was successfully performed, leading to immediate hemodynamic improvement and restoration of perfusion to the lower extremities. Careful perioperative monitoring and postoperative cardiac management are vital in such high-risk cases.

3. Conclusion

Early recognition and intervention in congenital cardiac anomalies like CoA are crucial. Balloon coarctoplasty served as an effective and less invasive method of relieving the aortic obstruction in this 2-month-old infant, which is the first step of a multistage care plan to ensure proper growth and development. Continued follow-up is necessary to monitor for restenosis or progression of cardiac dysfunction.

References

[1] Barash PG, Cullen BF, Stoelting RK, Cahalan MK, Stock MC, Ortega R. Clinical Anesthesia. 9th ed. Philadelphia: Wolters Kluwer; 2023. Chapter: Anesthesia for Congenital Heart Disease.
[2] Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL. Miller's Anesthesia. 10th ed. Philadelphia: Elsevier; 2024. Section: Pediatric Cardiac Anesthesia and Interventional Cardiology.
[3] Andropoulos DB, Gregory GA. Gregory's Pediatric Anesthesia. 6th ed. Oxford: Wiley-Blackwell; 2021. Chapter: Anesthesia for Cardiac Catheterization and Interventional Procedures.
[4] Nichols DG, Ungerleider RM, Spevak PJ, et al. Critical Heart Disease in Infants and Children. 3rd ed. Philadelphia: Elsevier; 2019. Chapter: Coarctation of the Aorta.
[5] Park MK. Park's Pediatric Cardiology for Practitioners. 7th ed. Philadelphia: Elsevier; 2021. Chapter: Obstructive Lesions of the Left Heart.
[6] Baum VC, O'Flaherty JE. Anesthesia for Genetic, Metabolic, and Dysmorphic Syndromes of Childhood. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2015. Relevant sections on congenital heart disease.
[7] Rao PS. Balloon angioplasty for coarctation of the aorta: A review. Clinical Cardiology. 2019;42(7): 640–647.
[8] American Heart Association (AHA). Guidelines for the Management of Congenital Heart Disease in Infants and Children. Circulation. Latest update.