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Titrated Epidural Anaesthesia for Urgent Caesarean Delivery in a Parturient With Uncorrected Coarctation of the Aorta

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Abstract

Congenital coarctation of the aorta is usually corrected in childhood, but uncorrected disease may persist into adulthood and poses risks during pregnancy. A woman in her 20s with uncorrected coarctation, systemic hypertension, and an exaggerated hypertensive response to exercise underwent urgent caesarean delivery at 36 weeks and five days because of preterm labor and breech presentation. Standard monitoring and invasive arterial blood pressure monitoring were established. Epidural anesthesia was performed at the third-fourth lumbar interspace using incremental ropivacaine boluses (105 mg over 20 min) with sufentanil 10 µg, achieving a sensory block to the fifth thoracic dermatome. Transient hypotension, with a mean arterial pressure of 60 mmHg, was treated with three 5 µg intravenous boluses of noradrenaline base. Maternal and neonatal courses were uneventful. This case illustrates an individualized approach combining epidural titration, hemodynamic monitoring, and prompt treatment of hypotension; applicability to patients with severe coarctation remains uncertain.

Categories: Obstetrics/Gynecology, Anesthesiology
Keywords: adult congenital heart disease (achd), anesthesic management, aortic coartation, cesarean section (cs), lumbar epidural anesthesia

Introduction

Coarctation of the aorta (CoA) is a congenital heart defect characterised by focal narrowing of the aorta, typically at the level of the aortic isthmus. Severe CoA often presents in the neonatal period, whereas milder forms may remain undetected until adulthood, when they are frequently identified during investigation of hypertension. The obstruction increases left ventricular afterload, creates a systolic pressure gradient across the narrowed segment, and can lead to proximal hypertension and impaired distal perfusion [1]. Advances in the management of congenital heart disease have resulted in an increasing number of women with CoA reaching childbearing age.

Pregnancy in women with uncorrected CoA carries an increased risk of maternal and foetal complications, particularly in the presence of significant aortic obstruction, uncontrolled hypertension or associated aortopathy [2]. The haemodynamic adaptations of pregnancy, including increases in cardiac output, blood volume and heart rate, impose an additional burden on the cardiovascular system and may increase the risk of hypertensive complications, heart failure and aortic complications.

Vaginal delivery is generally preferred, while caesarean delivery is reserved for obstetric indications or selected high-risk cardiovascular conditions, including aortic aneurysm, heart failure or severe hypertension [2]. In patients with uncorrected CoA, anaesthetic management aims to maintain adequate cardiac output while avoiding tachycardia, which can impair ventricular filling, and hypotension, which can compromise organ perfusion distal to the obstruction [1]. Evidence to guide anaesthetic management in pregnant women with uncorrected CoA remains limited.

During pregnancy, maintaining maternal cardiac output and adequate distal arterial pressure is particularly important for preserving uteroplacental perfusion. These goals require appropriate monitoring and careful anaesthetic techniques to minimise abrupt haemodynamic changes. Titrated epidural anaesthesia can play an important role, as incremental dosing allows the block to take effect gradually, with the aim of minimising abrupt haemodynamic changes while providing time to monitor the haemodynamic response. We report the peri-operative management of urgent caesarean delivery under titrated epidural anaesthesia in a woman with uncorrected CoA, preserved ventricular function, and borderline haemodynamic severity, highlighting the anaesthetic considerations associated with this uncommon clinical setting.

Case Presentation

We report the case of a woman in her 20s (88 kg, 155 cm) with congenital heart disease who underwent urgent caesarean delivery. Her history included patent ductus arteriosus ligation at age three, a functionally

preserved bicuspid aortic valve, and uncorrected aortic coarctation diagnosed in early adulthood during hypertension evaluation. A CT angiography and cardiac MRI showed focal proximal descending aortic narrowing, with a minimum diameter of 11 mm and a cross-sectional area corresponding to 53% of that at the diaphragmatic level (Figure *1*). The CT angiography showed no collateral vessels arising from the subclavian, internal mammary, or intercostal arteries. Left ventricular ejection fraction was preserved (58%). At a pre-pregnancy cardiology assessment, blood pressure was 155/77 mmHg in the upper extremities and 157/81 mmHg in the lower extremities, with no upper-to-lower limb systolic pressure drop. Ambulatory monitoring showed mean daytime blood pressure of 135/91 mmHg with a preserved dipper pattern. Exercise testing demonstrated an exaggerated hypertensive response, rising from 165/101 mmHg at rest to 258/101 mmHg at peak exercise, with mildly reduced capacity (6.9 METs). The cardiology assessment considered the haemodynamic significance of the coarctation borderline, weighing the exaggerated hypertensive response to exercise and the aortic area ratio of 0.53 against the absence of a lower-limb pressure drop or a continuous murmur. Corrective intervention had not been performed before pregnancy. Before pregnancy, hypertension was treated with losartan and carvedilol; after conception, these were replaced by nifedipine and bisoprolol, with systolic pressure approximately 135 mmHg. Exertional dyspnoea had been documented at an earlier cardiology assessment, but she reported no cardiovascular symptoms at the pre-anaesthetic assessment.



FIGURE 1: Sagittal CT angiography of the thoracic aorta

Red arrow: Focal narrowing of the proximal descending aorta

At 33 weeks and three days of gestation, she was admitted following abnormal foetal Doppler findings. Ultrasound showed breech presentation and normal amniotic fluid volume, and cardiotocography was reassuring. Antenatal corticosteroids were initiated. Following multidisciplinary assessment by the obstetric, cardiology and anaesthetic teams, an individualised delivery plan was agreed, considering the severity of the coarctation, blood pressure control, preserved ventricular function and breech presentation. Caesarean delivery had been planned at 37 weeks for breech presentation; however, labour onset prompted urgent caesarean section at 36 weeks and five days.

Neuraxial anaesthesia was preferred to avoid haemodynamic disturbances associated with induction, laryngoscopy and tracheal intubation. Following discussion of anaesthetic options and associated risks, lumbar epidural anaesthesia was selected to allow gradual block onset and minimise abrupt haemodynamic

changes, and informed consent was obtained. Standard American Society of Anaesthesiologists (ASA) monitoring was applied, and invasive arterial blood pressure monitoring was established via left radial artery cannulation. Oral sodium citrate 30 mL, intravenous ondansetron 4 mg, and pantoprazole 40 mg were administered for aspiration prophylaxis, and cefazolin 2 g for antimicrobial prophylaxis. With the patient sitting, the L3-L4 epidural space was identified by a midline loss-of-resistance-to-saline technique using an 18G Tuohy needle. A cephalad-directed catheter was inserted on the first attempt, leaving 5 cm epidurally. Ropivacaine 7.5 mg/mL was administered incrementally in four boluses (45, 15, 30 and 15 mg), totalling 105 mg over 20 minutes, with sufentanil 10 µg. Between boluses, the sensory level and haemodynamic response were reassessed to guide further dosing. A T5 sensory block, assessed by loss of cold sensation, was achieved and provided adequate surgical anaesthesia throughout the procedure, with no discomfort reported by the patient and no additional intraoperative local anaesthetic required.

Twenty-five minutes after the final epidural bolus and three minutes after delivery, mean arterial pressure decreased from approximately 90 to 60 mmHg (33%). An intravenous bolus of 5 µg noradrenaline base was administered, followed by an increase in recorded mean arterial pressure to 88 mmHg. Two further boluses of the same dose were administered 10 and 15 minutes after the first in response to smaller decreases in blood pressure, with the aim of maintaining mean arterial pressure at approximately 70 mmHg, around 20% below baseline. Heart rate remained stable at 75-85 beats/min.

Following delivery, oxytocin 3 IU was administered intravenously, followed by a continuous infusion for postpartum haemorrhage prophylaxis (10 IU diluted in 500 mL of saline and administered over four hours). Estimated blood loss was 300 mL, and a total of 1500 mL of intravenous fluids was administered during the caesarean delivery. No other intraoperative complications occurred.

Postoperative analgesia was managed with an epidural regimen consisting of 2 mg of morphine every 24 hours and as-needed 6 mL boluses of 2 mg/mL^{-1} ropivacaine no more frequently than every six hours. Two ropivacaine boluses were administered within the first 24 hours, and only a single dose of epidural morphine was administered throughout the postoperative period. This regimen was supplemented with intravenous paracetamol 1 g and ketorolac 30 mg, both administered every eight hours. The patient was monitored in a high-dependency unit, and analgesia was reviewed daily by the acute pain team until epidural catheter removal at 48 hours. No medication-related adverse effects were observed. The neonate weighed 2960 g and had Apgar scores of 8, 9 and 10 at 1, 5 and 10 min, respectively [3]. Admission to a neonatal intensive care unit was not required.

The maternal postoperative and neonatal courses were uneventful. No maternal complications occurred during the postoperative hospital stay, and no delayed cardiovascular complications were observed before discharge on postoperative day three. She underwent successful endovascular stent implantation for definitive correction of the aortic coarctation approximately one year postpartum.

Discussion

This case demonstrates the successful perioperative management of a parturient with congenital cardiovascular disease undergoing caesarean section under epidural anaesthesia. Coarctation of the aorta in pregnancy poses haemodynamic challenges, characterised by limited tolerance to abrupt changes in preload, afterload, heart rate, and an elevated risk of hypertensive crisis, aortic dissection, and uteroplacental insufficiency, requiring tailored anaesthetic and obstetric care. It is fundamental to have a complete preoperative cardiovascular evaluation and risk stratification, as well as a multidisciplinary approach with the obstetric, cardiology, and anaesthetic team to craft an individualised approach [2,4]. In addition, blood pressure control throughout pregnancy and in the preoperative period is essential to reduce the risk of maternal cardiovascular complications and preserve adequate uteroplacental perfusion.

Vaginal delivery is considered the preferred mode of delivery in women with congenital heart disease, as it is associated with lower blood loss and fewer haemodynamic perturbations, compared with caesarean delivery. Caesarean delivery is usually reserved for specific obstetric indications or selected high-risk cardiac conditions, including concomitant aortic aneurysm, decompensated heart failure, and severe hypertension [2]. The obstetric team decided on caesarean delivery because of breech presentation.

Epidural anaesthesia was selected to provide a gradual, titratable sympathetic block through incremental administration of local anaesthetic and reassessment before each additional dose, with the aim of limiting abrupt haemodynamic changes typically associated with single-shot spinal anaesthesia, thereby reducing the risk of sudden afterload reduction. Nevertheless, mean arterial pressure decreased by approximately 33% despite careful titration. This illustrates that a gradual epidural technique does not eliminate the risk of clinically significant hypotension and must be accompanied by close monitoring and readiness to administer vasopressor treatment. Epidural sufentanil was administered with the aim of improving block quality and reducing local anaesthetic requirements. Compared to general anaesthesia, epidural anaesthesia avoids the haemodynamic changes associated with induction, laryngoscopy, tracheal intubation, and positive-pressure ventilation, all of which may be poorly tolerated in patients with underlying congenital cardiac diseases [5].

A review of the literature reveals that published data on pregnancy in women with uncorrected Coarctation of the aorta are limited to a small number of case reports and case series. Consistent with our case, neuraxial techniques, specifically epidural anaesthesia, have been successfully used. Bourgeade et al. described the use of combined spinal-epidural anaesthesia for caesarean delivery in a patient with severe hypertension and foetal growth restriction; despite a low-dose spinal and a titrated epidural top-up, significant hypotension occurred, requiring vasopressor support [6]. Barcellos et al. reported successful management with continuous epidural anaesthesia, without significant hypotension or vasopressor requirements, and Ruys et al. described a patient with native coarctation complicated by a large aortic aneurysm who underwent elective caesarean section under low-dose epidural anaesthesia [7,8]. This case adds to the limited evidence supporting carefully titrated epidural anaesthesia in parturients with uncorrected CoA; however, its applicability to patients with more severe coarctation or additional high-risk cardiovascular features remains uncertain.

The transient intraoperative hypotension, an expected consequence of neuraxial sympathetic blockade, was promptly recognised and effectively treated with intravenous noradrenaline base boluses. Vasopressor administration is a cornerstone in the management of neuraxial anaesthesia-induced hypotension in obstetric patients, as maternal hypotension may compromise uteroplacental perfusion and contribute to adverse foetal outcomes. Noradrenaline is increasingly used for neuraxial anaesthesia-induced hypotension in obstetric patients. Beyond its established efficacy in maintaining maternal blood pressure, noradrenaline was particularly advantageous in this case, as its predominantly α-adrenergic effect, with additional β-adrenergic activity, preserves systemic vascular resistance with less bradycardia. This haemodynamic profile is particularly advantageous in this patient with fixed aortic obstruction, where increases or decreases in heart rate may adversely affect cardiovascular performance [9,10].

Conclusions

This case illustrates that carefully titrated epidural anaesthesia may be considered as part of an individualised, multidisciplinary approach to parturients with uncorrected coarctation of the aorta. In similar patients, gradual establishment of neuraxial blockade, combined with invasive blood pressure monitoring and individualised haemodynamic targets, facilitates early recognition and prompt treatment of hypotension, which may occur despite careful titration. However, given the borderline haemodynamic severity and preserved ventricular function in this patient, these observations cannot be generalised to patients with more severe coarctation or associated ventricular dysfunction.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **AI use statement:** The authors used ChatGPT (OpenAI) - GPT-6 as follows: language polishing, structure or formatting, translation in Abstract, Introduction, Case Presentation, Discussion, Conclusions, and References. The authors reviewed and revised all AI-assisted text to ensure that it accurately reflected the clinical case and their interpretation. Clinical details were checked against the original medical records, and references were verified against the original sources. The authors take full responsibility for the accuracy and integrity of the final manuscript. The authors confirm that they have reviewed and verified all AI-assisted content and take full responsibility for the work. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Cannesson M, Earing MG, Collange V, Kersten JR: Anesthesia for noncardiac surgery in adults with congenital heart disease. Anesthesiology. 2009, 111:432-440. 10.1097/ALN.0b013e3181ae51a6
2. De Backer J, Haugaa KH, Hasselberg NE, et al.: 2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. Eur Heart J. 2025, 46:4462-4568. 10.1093/eurheartj/ehaf193
3. Apgar V: A proposal for a new method of evaluation of the newborn infant. Originally published in July 1953, Volume 32, pages 250-259. Anesth Analg. 2015, 120:1056-1059. 10.1213/ANE.0b013e31829bdc5c
4. Nasr VG, DiNardo JA: Coarctation of the aorta. The Pediatric Cardiac Anesthesia Handbook. Wiley-Blackwell, Hoboken, NJ; 2017. 77-82. 10.1002/9781119095569.ch10
5. Hill NE, Granlund B: : Anesthesia for Labor, Delivery, and Cesarean Section in High-Risk Heart Disease . StatPearls Publishing, Treasure Island; 2023.
6. Bourgeade F, Malinovsky JM: Anaesthetic management for caesarean section in a parturient with uncorrected coarctation of the aorta. Ann Fr Anesth Reanim. 2010, 29:642-644. 10.1016/j.annfar.2010.07.006
7. Barcellos BM, Loureiro FM, Sampaio LF, de Resende MA: Double invasive blood pressure monitoring for cesarean delivery in a pregnant woman with aortic coarctation. A A Case Rep. 2016, 7:67-70. 10.1213/XAA.0000000000000344
8. Ruys TP, Bekkers JA, Duvekot JJ, Roos-Hesselink JW: A pregnant patient with native aortic coarctation and aneurysm. Aorta. 2014, 2:110-112. 10.12945/j.aorta.2014.13-038
9. Kinsella SM, Carvalho B, Dyer RA, et al.: International consensus statement on the management of hypotension with vasopressors during caesarean section under spinal anaesthesia. Anaesthesia. 2018, 73:71-92. 10.1111/anae.14080
10. Bhat AD, Singh PM, Palanisamy A: Neuraxial anaesthesia-induced hypotension during Caesarean section. BJA Educ. 2024, 24:113-120. 10.1016/j.bjae.2024.01.003