Pregnancy is associated with increased coarctation-associated complications. We report the successful management of emergency lower-segment cesarean delivery in a patient with coarctation of aorta. A parturient at 34 weeks of gestation of a twin pregnancy with uncorrected coarctation of aorta was taken for emergency lower-segment cesarean delivery to be performed using epidural anesthesia. A mixture of lignocaine (lidocaine), bupivacaine, and fentanyl was administered epidurally. In view of unsatisfactory motor action, general anesthesia had to be administered. However, because of sufficient analgesia due to the epidural drugs, optimal hemodynamic control was achieved. A combination of general and epidural anesthesia minimizes adverse effects of coarctation of aorta, with improved maternal and fetal outcomes.

**Keywords:** Cesarean delivery, coarctation of aorta, epidural, obstetric anesthesia.

Worldwide, the incidence of congenital heart disease is 7 to 10 of 1,000 live births, with 6% of them being coarctation of aorta. In developed countries, coarctation of aorta is diagnosed early in life; however, most affected females in developing countries do not receive a diagnosis until early adulthood, when their pregnancy becomes complicated. Pregnancy is associated with an increased incidence of coarctation-associated complications such as left ventricular failure, aortic dissection, and rupture of Berry aneurysms. Adverse pregnancy outcomes such as neonatal growth restriction, abruptio placentae, and premature delivery are also a concern. We report the successful management of an emergency lower-segment cesarean delivery (LSCD) in a patient with a twin pregnancy and a previous LSCD, using a combination of general and epidural anesthesia.

**Case Summary**

A 32-year old woman who was 145 cm tall, gravida 2, para 1, living 1, and carrying twins with a gestational age of 34 weeks, presented in labor. During her previous pregnancy 4 years earlier, she was suspected of having pregnancy-induced hypertension and had undergone LSCD under general anesthesia uneventfully, delivering a healthy female newborn. She discontinued her antihypertensive medications postoperatively.

On admission in labor, her heart rate (HR) was 100/ min, and her blood pressure was 220/140 mm Hg in the upper limbs and 140/80 mm Hg in the lower limbs, measured in the sitting position. A grade 4 ejection systolic murmur in the left parasternal region radiating to the back was audible. Two-dimensional echocardiography revealed significant coarctation in the descending thoracic aorta, normal aortic valve, and concentric left ventricular hypertrophy. The pre- , post- , and the coarctation segments measured 14, 8, and 6 mm, respectively, with a pressure gradient of 90 mm Hg across the coarctation. She had no signs of heart failure. The results of serum biochemistry testing was unremarkable. Fundoscopy findings ruled out papilledema.

A decision was made to perform the operation using epidural anesthesia. Monitors included cardio- scope, pulse oximeters in the upper and lower limbs, invasive blood pressure through the radial and dorsalis pedis arteries, central venous pressure (CVP), temperature, and urine output. Antiaspiration prophylaxis in the form of metoclopramide, 10 mg, and ranitidine, 50 mg, was administered intravenously. Preloading was done with 500 mL of Ringer’s lactate using CVP guidance. A closed-tip, multiorifice, 18-gauge epidural catheter was inserted through the L2-L3 interspace and fixed with the tip approximately at the T9 level. After a test dose of 2 mL of 2% adrenalized lignocaine (lidocaine), the patient was positioned supine with a 15° wedge under the right buttock. A 5-mL solution of 2% lignocaine and an injection of 0.5% bupivacaine with fentanyl, 1 μg/mL, were given epidurally in incremental doses. The total volume injected through the epidural route was 20 mL.

Although sensory blockade, as elicited by pinprick,
was achieved through the T6 segment, satisfactory motor blockade could not be achieved. A repeated fetal assessment was sought, and the obstetric team decided against waiting any longer because there were signs of fetal distress. In view of the emergency situation, it was decided to administer general anesthesia.

After preoxygenation, rapid-sequence induction was achieved using sodium pentothal, 200 mg, and suxamethonium (succinylcholine), 75 mg. Esmolol, 20 mg, was used to prevent a sympathetic response to intubation. Anesthesia was maintained with sevoflurane in a 1:1 mixture of oxygen and nitrous oxide. After delivery of the second neonate, 1 mg of midazolam, 50 μg of fentanyl, and 5 mg of frusemide were administered intravenously. Oxytocin, 15 IU, in 500 mL of Ringer's lactate was infused over 30 minutes. Hemodynamic parameters during the intraoperative period are noted in the Table. Vasopressors were not required throughout the intraoperative period. Blood loss of 700 mL was replaced with 1,000 mL of crystalloid. The total duration of surgery was 60 minutes.

At the end of surgery, the patient was fully awake and was uneventfully extubated. Esmolol, 10 mg, was used to avoid an extubation response. Tramadol, 50 mg, was administered epidurally for postoperative analgesia, and the epidural catheter was removed. The patient was shifted to a high-dependency unit with regular cardiology consultations for postoperative monitoring and management.

Discussion

Coarctation of aorta occurs in approximately 7% of patients, with congenital heart disease being more common in males than females. It may occur in isolation or in association with other lesions, most commonly bicuspid aortic valve and ventricular septic defect. This lesion presents a fixed obstruction to the left ventricular outflow tract that causes a relative increase in blood flow to the head and upper extremities proximally and hypoperfusion to the body distally. Complications include systemic hypertension, left ventricular failure, aortic dissection, premature ischemic heart disease due to chronic hypertension, infective endocarditis, and cerebral vascular accidents due to rupture of intracerebral aneurysms.

Pregnancy exacerbates these effects because cardiac output is greatly increased over prepregnancy levels. An increased myocardial workload puts the patient at high risk of left ventricular failure. In addition, coarctation of aorta may also be associated with decreased uterine perfusion, leading to deleterious effects on the fetus. Fetal mortality has been reported to be as high as 20%, and reported maternal mortality is as high as 3%. Even women with corrected coarctation have an increased risk of aortic dissection and rupture of a cerebral aneurysm in the third trimester and the peripartum period because of hemodynamic and hormonal changes.

Anesthetic management of patients with aortic coarctation focuses on minimizing hemodynamic disturbances. The anesthetic goals are to maintain normal to slightly elevated systemic vascular resistance, normal to slightly elevated heart rate, adequate intravascular volume and venous return, and invasive hemodynamic monitoring. Monitoring blood pressure is equally important proximal and distal to the coarctation because any decrease in blood pressure beyond the site of coarctation results in reduced perfusion of maternal vital organs such as liver, spleen, and kidneys, as well as placental and fetal hypoperfusion. Hence, invasive blood pressure monitoring is mandated, as is continuous monitoring of oxygen saturation in upper and lower limbs, as was done in our case. The intravascular volume status can be monitored through the CVP line.

Both general and “graded” regional anesthetic techniques have been demonstrated safely in management of such a case. Opioid-based general anesthesia can be used, but it has its own disadvantages such as respiratory depression in both the parturient and the neonate. We decided to administer regional anesthesia to avoid the hemodynamic fluctuations associated with general anesthesia. A segmental epidural technique was chosen to limit the extent of sympathetic blockade and minimize the

<table>
<thead>
<tr>
<th>Time point</th>
<th>Heart rate, /min</th>
<th>Blood pressure, mm Hg</th>
<th>SpO2, %</th>
<th>CVP, cm H2O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before start of epidural catheter placement</td>
<td>100</td>
<td>200/130</td>
<td>120/98</td>
<td>99</td>
</tr>
<tr>
<td>After epidural injection</td>
<td>107</td>
<td>170/110</td>
<td>114/90</td>
<td>100</td>
</tr>
<tr>
<td>Before general anesthesia induction</td>
<td>109</td>
<td>160/110</td>
<td>102/84</td>
<td>100</td>
</tr>
<tr>
<td>After intubation</td>
<td>114</td>
<td>166/112</td>
<td>109/88</td>
<td>100</td>
</tr>
<tr>
<td>After delivery</td>
<td>110</td>
<td>158/92</td>
<td>102/76</td>
<td>100</td>
</tr>
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<td>105</td>
<td>152/84</td>
<td>104/82</td>
<td>100</td>
</tr>
<tr>
<td>After extubation</td>
<td>102</td>
<td>158/102</td>
<td>102/82</td>
<td>100</td>
</tr>
</tbody>
</table>

Table. Perioperative Hemodynamic Parameters

Abbreviations: CVP, central venous pressure; LL, lower limb; SpO2, oxygen saturation measured by pulse oximetry; UL, upper limb.
resultant hypotension that would jeopardize fetal perfusion and maternal vital organ perfusion. However, failure to achieve adequate motor blockade, a known limitation of such a technique (up to 32% in thoracic and 27% in lumbar epidural anesthetics and up to 5% of cases in pregnancy)\(^5\) and the emergency of the situation (signs of fetal distress) necessitated conversion to general anesthesia.

Antisialogogues such as glycopyrrolate and atropine were avoided in premedication to avoid resultant tachycardia. Esmolol, an ultrashort-acting β-blocker, has been popularly used to prevent a sympathetic response to endotracheal intubation and extubation, and it was used effectively here too, as seen in the Table. Prophylactic administration of frusemide was indicated to counter the sudden increase in intravascular volume after delivery, which may precipitate left ventricular failure. The epidurally administered local anesthetics helped to a great extent in keeping the hemodynamic parameters within satisfactory control with minimal requirement of supplemental medications.

**Conclusion**

A thorough preoperative evaluation and a multidisciplinary approach that includes anesthesiologists, obstetricians, and cardiologists are both vital to successfully manage a case of twin pregnancy with coarctation of aorta for cesarean delivery. Although both carefully administered general and regional anesthesia are equally effective in such a case, each technique comes with its own complications. We suggest that a combination of general and epidural anesthesia, with careful perioperative hemodynamic monitoring, may minimize the adverse effects and improve maternal and fetal outcomes.

**REFERENCES**


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**DISCLOSURES**

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