Management of preeclampsia after heart transplant

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Abstract

We present a 20-year-old primiparous patient status post heart transplant at 6 months with long-standing hypertension progressing to super-imposed preeclampsia. Pregnancy and delivery after thoracic transplantation is no longer a rare occurrence, however, these women are at a greater risk of gestational hypertension and preeclampsia.1 Current literature does not provide treatment guidelines for treatment of hypertensive disorders in patients with a transplanted heart. In this case report, we explore the different treatments for maintaining blood pressures in the transplanted neurovascular system, effects of eclampsia prevention on blood pressure, and how fluctuations in blood pressure in a long-standing hypertensive can affect fetal heart tracings. A literature search was conducted using terms "solid organ transplant and preeclampsia", "Anti-hypertensive drugs post heart transplant", and "hypertension after heart transplantation". No reviews on treatment of preeclampsia in cardiac transplant recipients were evident.

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Introduction

Our patient is a 20-year-old female with a history of hypoplastic left heart status post cardiac transplant at 6 months of age. She was originally maintained on cyclosporine as the primary immunosuppressive medication. This medication is well known to cause kidney issues and hypertension. She was diagnosed with hypertension shortly after her transplant and was started on an ACE inhibitor. The patient has never had any acute or chronic rejection episodes. Within a few years of transplant, she developed Epstein-Barr Virus (EBV) associated Post-Transplant Lymphoproliferative Disease (PTLD) and her cyclosporine was stopped around age 5. She was started on CellCept as her only immunosuppressive medication after clearance of the PTLD. Prior to pregnancy, her hypertension was easily managed on enalapril 10mg and immunosuppression on mycophenolic acid 500mg.

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Case Report

The patient presented for prenatal care and pregnancy was confirmed at 6 weeks gestational age. She was not using contraception, and the pregnancy was unplanned but desired. At that time, her medications were adjusted; the enalapril and mycophenolic acid were discontinued and she was started on nifedipine 30mg daily and tacrolimus 4mg BID with a goal tacrolimus level of 4-8. Because CellCept is a teratogen, this was switched to low dose tacrolimus when it was discovered she was pregnant. Heart transplant patients are at higher risk for rejection both during and after pregnancy.[1] The patient was also advised to start taking aspirin 81mg for preeclampsia precautions due to her longstanding hypertension and elevated risk due to transplantation.[2] Baseline labs were obtained and as follows: Creatinine 0.8, Platelets 236, AST/ALT 18/14, 24-hour urine protein 95 mg.

Maternal echocardiograms were scheduled during the first and third trimesters to evaluate cardiac function throughout the pregnancy.[3] These were normal and showed no change from baseline ejection fraction. Fetal echo was performed at 20 weeks gestation due to maternal history increasing the risk for fetal cardiac malformations. It was normal.

From the beginning of the pregnancy, this patient required multidisciplinary care. The Maternal Fetal Medicine department held a care conference concerning the complexities of her treatment.

Physicians and other healthcare workers from pediatric cardiology, anesthesia, and the cardiovascular ICU department were involved. The main medical goals were a vaginal delivery with adequate pain control and blood pressure stabilization.

At 36-weeks and 4-days gestation, the patient presented to clinic for a routine prenatal visit. She was complaining of feeling unwell and reported a headache, but she attributed this to a sinus infection. She reported some higher blood pressures of 150/80 mmHg earlier in the week. Her initial mechanical blood pressure was 152/88 mmHg, which was then rechecked twice manually and found to be 146/93 mmHg and 146/100 mmHg. She was admitted to Labor and Delivery for concern of super-imposed preeclampsia. HELLP labs were collected and as follows: Creatinine 1.2, Platelets 267, AST/ALT 24/13, and 24-hour urine protein 2220 mg.

The patient was induced for superimposed preeclampsia with severe features due to blood pressure criteria. Initially, induction began with Foley bulb placement. After it fell out, Misoprostol 25 mcg was administered twice for cervical ripening. Oxytocin was titrated up to 15 cc/hr overnight. Patient had spontaneous rupture of membranes, and oxytocin was discontinued due to late decelerations. Vaginal deliveries are recommended in transplant patients unless cesarean is otherwise indicated.[4] Adequate pain control is a concern due to the effect of pain on blood pressure and cardiovascular stress. An epidural of bupivacaine 0.1%-fentanyl 2 mcg at 12mL/hr was placed at the start of induction and was titrated to 14 cc/hr for adequate anesthesia. SBE prophylaxis was initiated with 2g IV Ampicillin every 6 hours throughout induction and labor.

The patient's blood pressure remained

elevated throughout the beginning of labor induction, ranging from 131-169/58-99 mmHg. The nifedipine dose was increased to 30 mg twice daily and administered.

Systolic blood pressures continued to be elevated above 165 mmHg, and IV hydralazine 5mg was administered. IV magnesium is used for maternal seizure prophylaxis with the potentially beneficial side effect of lowering blood pressure through vasodilation.[5] Magnesium sulfate at 50 cc/hr was administered. Overnight, the patient's blood pressure dropped to a range of 100s/50s mmHg, with a creatinine of 1.6 and fetal heart decelerations to 80 bpm.

With the labiality of the patient's blood pressure and late decelerations, the IV magnesium infusion was discontinued. A central line was placed and the patient was started on epinephrine 16 mcg/mL infusion. The epinephrine dosage was titrated to 22.6 mL/hr with minimal blood pressure improvement to 111/58 mmHg.

Norepinephrine 16 mcg/mL infusion was started and the patient's blood pressure returned to 150s/80s after titration up to 2.3 mL/hr. Fetal heart tracings returned to a normal baseline of 140 bpm.

The infant was born via spontaneous vaginal delivery 24 hours after induction of labor began. Weight was 2.85 kilograms and Apgar scores at 1 and 5 minutes were 9 and 9. No blood gas. There were no complications and disposition was to the newborn nursery. Maternal blood pressures continued to be elevated in the range of 150/90 mmHg, and PO nifedipine 30mg BID was prescribed. Blood pressure was maintained at 135-155/80-90 mmHg. The patient was discharged 3 days after delivery.

Three months post-delivery and the patient's blood pressure had stabilized at 129/67 mmHg, and nifedipine dose has decreased to 30mg daily under pediatric cardiologists recommendations. There has been no sign of transplant rejection. Mirena IUD was placed at 6-week postpartum visit.

Discussion

The delivery of a transplant patient is no longer a rare event. Along with the typical concerns of rejection, hypertension and preeclampsia are prevalent and a challenge to treat in allogeneic cardiac transplants. The labiality of this patient's blood pressure was a main concern, as hypertension is undesirable, but her sudden hypotension was the likely cause of fetal distress and acute kidney injury. The cause of this patient's hypotension is likely linked to the IV magnesium that was used as seizure prophylaxis. She was also administered nifedipine, a calcium channel blocker. It has been hypothesized that calcium channel blockers and magnesium can have compounding effects.[6] Nifedipine can also potentiate the toxic effects of IV magnesium. It is advised to be aware of the effects of magnesium and weigh the benefits of seizure prophylaxis against relative hypotension in a chronically hypertensive patient. These effects on the peripheral vascular system most likely led to the patient's hypotension.

Norepinephrine has greater effect on alpha receptors and was the more effective pressor in this patient. It was advised that beta-blockers would be ineffective on the transplanted vasculature, so hydralazine was used

for a fast acting hypertensive agent.[7] Norepinephrine appears to be the more effective alpha sympathetic agonist for blood pressure management in this patient's transplanted neuromuscular system, as blood pressure increases were minimal on epinephrine. Management likely was further complicated by the fact that heart transplant patients no longer have nervous control of the heart, as those nerves are severed during the transplant process. The transplanted heart rate depends on circulating catecholamines; there is no vagal control.

Recommendations include use of hydralazine for immediate blood pressure control for preeclamptic patients with allogenic cardiac transplants. Nifedipine is appropriate for chronic hypertension in these patients during pregnancy. These patients need intra-arterial blood pressure monitoring to maintain tight control of blood pressure and heart rate. IV magnesium for neuroprotection is standard of care, but it is imperative to have the support to administer pressors if the patient becomes hypotensive. Norepinephrine is superior to epinephrine in cardiac transplant patients.

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