Introduction

Vasoplegic syndrome is a well-recognized complication during cardiopulmonary bypass (CPB) and is associated with increased morbidity and mortality, especially when refractory to conventional vasoconstrictor therapy. This is the first reported case of vasoplegia on CPB unresponsive to methylene blue whereas responsive to hydroxocobalamin, which indicates that the effect of hydroxocobalamin outside of the nitric oxide system is significant or that the two drugs have a synergistic effect in one or multiple mechanisms.

Conventionally, methylene blue (MB) has been the treatment of choice due to its inhibition of cGMP and has been shown to be effective as both a preventive and rescue therapy. However, there have yet been randomized control trials of MB that indicate optimum dosage, timing of administration, or target population, leaving the possibility that MB may not be effective for all patients. Recently, hydroxocobalamin has also been revealed to inhibit the NO system and was successfully utilized for one case of CPB-associated refractory vasoplegia without attempting MB first. This present case demonstrates that despite unresponsiveness to MB, hydroxocobalamin can be effective in refractory vasoplegia, thus not only supporting a second rescue modality for refractory vasoplegia but also suggesting an alternative method of managing refractory vasoplegia if MB should fail.

Case Report

A 62-year-old male with a history remarkable for type 2 diabetes mellitus, coronary artery disease status postcoronary artery bypass grafting, and automatic implantable cardioverter defibrillator presented for a left ventricular assist device (LVAD) as a bridge to transplantation.

During the preoperative optimization phase, the patient had the following vital signs: heart rate, 101 beats/min; noninvasive...
Hydroxocobalamin is a highly bioavailable form of vitamin B12. Proposed mechanism of the drug may include the NO system like that of MB as well as a second mechanism involving hydrogen sulfide (H\(_2\)S)-induced vasodilation.\(^6,^7\) As a factor independent of NO, H\(_2\)S has been proposed in animal models to be released by endothelial tissue and act by modifying endothelial potassium channels consequently inducing hyperpolarization and vascular relaxation.\(^6\) Hydroxocobalamin binds to H\(_2\)S to be excreted, and thus this drug has been approved for H\(_2\)S toxicity.\(^7\) Hydroxocobalamin is currently available as a lyophilized form and is approved for cyanide poisoning at a dose of 5 g in 15 min by intravenous infusion for a maximum dose of 10 g. No recommendations have been made for vasoplegia. In terms of treatment for vasoplegia, studies in anesthetized rabbits demonstrate moderate pressor effect of hydroxocobalamin resulting increase in SVR, BP, and decrease in cardiac output (4). However, cyanocobalamin, a typical B12 formulation sold over the counter, did not induce the same effects of increased BP and SVR.\(^8\) In healthy human volunteers, hydroxocobalamin was associated with increased BP up to 4 h with the maximum increase of 27 and 25 mmHg in systolic and diastolic pressure, respectively.\(^9\) Similar to MB, hydroxocobalamin has also not been studied in randomized controlled trials for vasoplegia. Thus, its parameters of effect are largely unknown. The drug’s side effects may include a papular rash, headache, nausea, pruritus, chest discomfort, dysphagia, and decrease in lymphocytes.\(^9\) Due to its red coloring, hydroxocobalamin may also falsely elevate hematocrit and pulse oximetry.

Hydroxocobalamin was utilized in this case to be an effective treatment for refractory vasoplegia. Thus far, two additional cases have reported success with hydroxocobalamin, one without MB after CPB and the other during liver transplantation.\(^5,^10\) This is the first reported case of vasoplegia on CPB unresponsive to MB whereas responsive to hydroxocobalamin, which potentially indicates that the effect of hydroxocobalamin outside of the NO system is significant or that the two drugs have a synergistic effect in one or multiple mechanisms.
More research is indicated to elucidate the mechanism of vasoconstriction by hydroxocobalamin.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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