A novel way to perform intraoperative autologous blood transfusion during a pediatric heart transplant: A Case Report

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Introduction

Acute normovolemic hemodilution (ANH) was introduced in the early 1970s and entails the removal of blood immediately before or shortly after the induction of anesthesia, with the maintenance of isovolemia using crystalloid and/or colloid replacement (1). Although this technique is used in select cardiac surgeries in both adult and pediatric populations, its use has not been employed in orthotopic heart transplant operations due to the need to transfuse leukocyte reduced products to newly transplanted patients to prevent alloimmunization (2). One of the main values of ANH is the conservation of plasma and platelets. To our knowledge, ANH has not been reported in pediatric patients undergoing heart transplants. We report a case where two units of autologous whole blood cells were removed shortly after the induction of general anesthesia in a 14 year old female undergoing heart transplantation for dilated cardiomyopathy.

References


Case Report

- 14 year old, 59kg, ASA IV female with the diagnosis of idiopathic dilated cardiomyopathy was scheduled for an orthotopic heart transplant.
- Her past medical history included a full term delivery, previously healthy female, with a recent presentation of heart failure and echocardiogram showing dilated cardiomyopathy with severely depressed left ventricular function, ejection fraction of 20%, and moderately depressed right ventricular function.
- Heart catheterization showed a low cardiac index of 1.5L/min/m2 and a high RV/EDP of 40mmHg.
- The patient had spent the past few months in the pediatric cardiothoracic intensive care unit on continuous dopamine and milrinone infusions. Other medications included aldactone, aspirin, carvedilol, diuril and lasix.

Intraoperative Course

Once a donor heart was available, the patient was taken to the operating room and general anesthesia was induced through a pre-existing right upper extremity PICC line and her airway was secured via endotracheal tube without any difficulty. Additional intravenous access was obtained with a 9.0 French double lumen catheter in the right internal jugular vein and a left radial arterial catheter was placed. A transesophageal echo probe was also placed. A baseline arterial blood gas showed a hematocrit of 53, thus before heparinization two units of autologous blood were removed via the right internal jugular vein to be used post bypass. The patient was stable during blood removal. Discussion with the surgeon and perfusionist for the autologous whole blood to be transfused to the patient after cardiopulmonary bypass using a leukocyte reduction filter yielded a “bedside” filter placed between a Belmont infuser and the patient (see picture). The Belmont infuser’s pressures for volume delivery were checked before and after leukoreduction filter placement to ensure rapid volume replacement would not be hindered with filter placement. The two units of autologous blood were transfused after the conclusion of cardiopulmonary bypass and the patient did not require additional blood products in the operating room nor on the post-operative days and had near normal coagulation studies shortly after undergoing solid organ heart transplantation. She was extubated on post operative day number one.

Discussion

- Leukoreduction is a process by which the number of leukocytes in cellular blood components is decreased. Most leukoreduced cell components are prepared by filtration shortly after collection or by an in-line filter when components are transfused.
- The scientific and clinical evidence demonstrates leukoreduction technology is an effective means to reduce the risk of three complications of transfusion: HLA alloimmunization, cytomegalovirus transmission, and recurrent febrile nonhemolytic transfusion reactions (3).
- In addition to leukocyte depleting filters to effectively attenuate the systemic inflammatory response, benefits in transplant surgery include prevention of alloimmunization because anti-HLA can mediate graft rejection and immune mediated destruction of platelets (2).
- This case report illustrates a novel technique whereby pediatric cardiac anesthesia providers may avoid the use of blood products during and after heart transplantsations in select pediatric patients.
- This is the first case to our knowledge where acute normovolemic hemodilution was performed during a pediatric heart transplant and bedside leukoreduction was used to transfuse the blood back to the patient, resulting in no additional blood products being needed in the operating room nor on the days following surgery.