Heart retransplantation in children without the use of blood product

Retransplante cardíaco em criança sem o uso de hemoderivados

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Abstract

This article reports a case of a cardiac retransplantation without the use of blood products, in a 6 year old child, with severe dilated cardiomyopathy after chronic graft rejection and refractory to clinical treatment. To avoid a blood transfusion in this surgery a multidisciplinary approach was planned, which involved the use of preoperative erythropoietin, acute normovolemic hemodilution and intraoperative cell salvage with autologous blood recovery system, as well as a meticulous hemostasis and reduced postoperative phlebotomy.


INTRODUCTION

Medicine is one of many areas of knowledge related to the maintenance and restoration of health. It works in a broad sense, with the prevention and cure of human and animal diseases in a medical context. This became evident in 1967 when it performed the first heart transplant between humans, by Barnard [1]. That same year, Kantrowitz et al. [2] tried, unsuccessfully, the first transplant in newborn patients with Ebstein anomaly. Only in 1984, after the introduction of cyclosporine in the handling of rejection, which Bailey et al. [3] performed the first transplant in a child with the hypoplastic left heart syndrome (HLHS).

In children with severe cardiomyopathy refractory to medical treatment, as in the case of non-compacted myocardium [4], or cardiogenic shock [5], heart transplantation is imposed as saving measure. The first heart transplant in an adult without use of blood transfusion occurred in 1985 [6]. At the Congress of the Brazilian Society of Cardiology (CSBC), 2009, a heart transplant was reported in a child 2 years and 9 months, without the use of blood products [7]. Neonatal and infant

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cardiac transplantation has enabled survival and improved quality of life in children with severe myocardial dysfunction [8]. The graft failure occurs in approximately 7% of heart transplants in children [9] and in these cases, retransplantation becomes the only therapeutic option. Well-defined strategies have enabled to reduce the use of blood transfusions in cardiac surgery [10,11]. The treatment by cardiac retransplantation, particularly for pediatric patients, is what has reduced prospects for organ procurement in a timely manner, especially at the lower weight and reduced availability of compatible donors. Recently, we discovered, after research in national and international literature, which had not yet been reports of retransplantation in children without the use of blood transfusion. Thus, we report a case of cardiac retransplantation in a 6 year old child without blood transfusion.

The study was approved by the Ethics Committee in Research of the Hospital Beneficência Portuguesa of São Paulo (São Paulo, SP, Brazil).

CASE REPORT

One child, female, with a diagnosis of HLHS at birth, was submitted initially to the first (04/11/2003) and second (03/19/2004) stage of the correction protocol Norwood. After 2 years and 4 months, she developed severe myocardial dysfunction, cardiac transplantation is necessary, performed on 29.07.2006, without the use of blood products [7].

The patient was uneventful until 2009, when she was again admitted to the Hospital Beneficência Portuguesa of São Paulo, with 6 years, weight 16.6 kg and body surface area of 0.69 m², respectively, diagnosed with congestive heart failure functional class IV according to New York Heart Association (NYHA), and ventricular tachycardia in severe chronic rejection refractory to immunosuppressive therapy (cyclosporine, mycophenolate, methylprednisolone), as well as the use of vasoactive drugs (dobutamine, milrinone, norepinephrine), evolving with rapid clinical deterioration, even to cardiogenic shock, requiring mechanical ventilation. A transthoracic echocardiogram revealed poor left ventricular function to a significant degree, with delta D of 16%. Due to this large hemodynamic instability without response to medical treatment, he was appointed the new heart transplant.

For religious reasons, parents requested that staff apply in this case the protocol management and conservation of blood to serious and complex heart surgery, the team created especially for surgery in adults but also in some cases in children, as shown in the CSBC, in 2011 [12]. With a more restrictive conduit for blood transfusion [13], this surgery was accepted.

Preoperatively, the child showed normal levels of hemoglobin (13.0 g / dl), hematocrit (38 mL / dL) and platelets (146 mil/mm³), nevertheless, we promptly began treatment with recombinant human erythropoietin (rHuEPO 600 IU / kg / week), ferrous sulphate (10 mg / kg / day), folic acid (5 mg / day), and cyanocobalamin (vitamin B12 5000 IU / day) because the optimum result of the stimulus erythrocytes occurs later after the first week [14].

With a schedule of any team (surgeon, physician, anesthesiologist, intensive care), was performed orthotopic cardiac retransplantation, on 12/13/2009, successfully and without administration of blood products. The total time of ischemia was 180 minutes. For surgery, we mini-circuit (mini-SCC) without human albumin in the priming, controlled hypotensive anesthesia, normothermia, acute normovolemic hemodilution (ANH) and, crucially, intraoperative recovery of cells (cell saver), and meticulous hemostasis.

Postoperatively, the child was kept normotensive and normothermic and also minimized the phlebotomy. RHuEPO were reintroduced, iron, vitamin B12 and folate and the beginning of immunosuppressants. The dose of cyclosporine was controlled according to their serum by means of radioimmunoassay method, maintaining the level of 300-400 ng / mL. The dose of mycophenolate sodium was 11.2 mg / kg / day. The lowest level of hemoglobin after surgery was 9.7 g / dl. Patient was discharged 40 days after transplantation and with normal levels of hemoglobin (Figure 1).
Since the retransplantation by that date, the child is in excellent general condition with normal biventricular cardiac function at the Doppler echocardiography (Figure 2), with no sign of rejection and lack of toxicity by immunosuppressants.

DISCUSSION

Since the first reported case of retransplantation in 1977 [15], experience with this procedure is still limited, especially in children. Vasculopathy and acute or chronic rejection of the graft represent the main indications [16]. In 1964, we performed the first heart surgery in the world without blood transfusion [17], and since then several other similar cases have been described in the literature [18]. Although some studies show, first, that surgery with massive bleeding not treated with blood transfusions increase the risk of death [19], which actually has been observed in the last decade, several studies showing increased morbidity [20], and fundamentally increase in mortality related to the practice of blood transfusions [21,22]. Another extension problem worldwide is the shortage of blood, raising great concern. In a situation of increasing demand for blood and blood products, with a stationary trend of donations, the emphasis is on lack of stocks in several countries [23]. In Brazil, the demand for blood increases 1% per year, while expectations for growth of blood donations ranging from 0.5% to 0.7% per year [24]. All this has contributed to seek medical treatment options [11] and more restrictive strategies [25] to avoid or minimize blood transfusions.

We have many protocols in the literature for performing pediatric heart surgery free of homologous blood transfusion, first, we mention the proposed by Gomez et al. [26], who enumerated several strategies in pre-, intra- and postoperatively. In 2008, other authors confirmed the efficacy and safety of these programs [27]. Another protocol considers the pre-autologous blood donation associated with the administration of erythropoietin [28].

Similarly, since 2002, also developed a program of management and conservation of homologous blood for cardiac surgery, which basically boils down to increase red cell mass (iron, folate and rHuEPO) [29,30], and the HNA, the Intraoperative recovery of cells [27] and, crucially, the surgical technique with meticulous hemostasis. Thanks to this program, multiple blood transfusions have been reduced or even avoided, especially in case of retransplantation.

CONCLUSION

It was possible to perform a cardiac retransplantation without the use of homologous blood in a child with severe dilated cardiomyopathy after chronic graft rejection and irreversible drug therapy, using a program management and conservation of blood, and rigorous multidisciplinary planning. Blood transfusions can be avoided or reduced when it is meant to preserve the autologous blood.

REFERENCES


