Is ABO group incompatibility really the reason of accelerated failure of cryopreserved allografts in very young patients? – Echography assessment of the European Homograft Bank (EHB) cryopreserved allografts used for reconstruction of the right ventricular outflow tract*

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Abstract

Right ventricular outflow tract reconstruction (RVOTR) with cryopreserved allograft for Ross operation and other congenital or acquired cardiac malformation has become a routine and currently, the procedure of choice for children and young patients. A tendency of accelerated degeneration in the youngest recipients has been reported. Some authors advocate the ABO group incompatibility as the main reason for such failure. This retrospective monocentric study presents the long-term outcome of the European Homograft Bank (EHB) cryopreserved allografts, used for RVOTR in Ross operation (group one) and other congenital heart malformation-s (group two). The evaluation of the allograft performance was done by means of echography, considering the allografts with the transvalvular gradient of ≥40 mm Hg and/or regurgitation of ≥3+ as failed. Fifty-one patients of group one and 123 of group two were analyzed after completed follow-up information. About 25.5% of patients of group one and 30.8% of group two had a compatible, whereas 74.5% of group one and 68.92 of group two an incompatible ABO group with the donor. The mean follow up was 45.77 and 68.88 months, respectively. In second group 22.76% received the aortic, while 77.24% pulmonary allograft. Only three cases of group one (5.88%) failed: one with a compatible (7.69%) and two with an incompatible ABO group (5.26%) (p = 0.1), whereas 39 patients (29.4%) of group two failed between 20.1 and 120.2 months (29.73% with and 29.07% without ABO compatibility, p = 0.03). Contrary, the age showed more importance in the allograft failure: out of 41 failed allografts, 24 (58.54%) were implanted in patients of 0–5 years (9 or 37.5% with compatible and 15 or 62.5% with incompatible ABO group). Generally, analysing both groups together, there was no influence of ABO mismatching on the allograft failure (p = 0.79). Contrary, there was a significant difference in survival between Ross and non-Ross group (p = 0.00082).

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Introduction

Reconstruction of the right ventricular outflow tract (RVOT) has become routine and the procedure of choice, after the pioneering works of Ross in London (Ross 1962) and Brian Barrat-Boyes in Auckland (Barrat-Boyes 1964), both doing first implantations of the human aortic valves (in the aortic position) in 1962, and publishing in the different years (1962 and 1964 respectively). This procedure gained popularity after establishing the cryopreservation as the best procedure for cardiovascular tissue preservation and protection, introduced by O’Brian et al. (1987). After establishing the European Homograft Bank (EHB) in Brussels in 1988 and the first implanted pulmonary allograft from this institution in May 1989 (Goffin et al. 1996), the EHB cryopreserved aortic and/or pulmonary allografts were systematically used for RVOTR in different situations of congenital and acquired cardiac malformations in many implantation centres within the European Community Countries and in Switzerland. The technique of implantation became easy for surgeons and haemodynamic performance of these valves showed satisfactory results. On the other side, these devices became more attractive, since the rate of thromboembolism and infection was very low, and there was no need for anticoagulation and long-term antibiotic protection any more (Rajani et al. 1998).

However, some of the authors reported a tendency of early allograft failure after implantation on the RVOT, especially in young patients (Clarke et al. 1993; Yankah 1997; Rajani et al. 1998; Christenson et al. 2003). Some of the authors have advocated the ABO blood group incompatibility as the most important factor for such a phenomenon (Yankah et al. 1995; Baskett et al. 1996; Christenson et al. 2003). Contrary, some other authors, such as Lange (2001), Kaden (2001) and others advocate no necessity for ABO group matching for long-term allograft outcome, since on their clinical trials the ABO (mis)matching did not influence the long-term allograft outcome.

But, some other factors, such as a small diameter of the allograft, the accelerated growth of the patients during the first year of life, etc. have been mentioned (Tweddell et al. 2000) as a possible factors for early allograft failure.

In this retrospective monocentric study we have compared the relationship between the ABO group incompatibility of the donor and recipient and long-term performance of the allografts, implanted in the RVOT. The relationship between the recipients age and the allograft failure has been analysed as well.

Methods

A total number of 174 patients who received EHB cryopreserved aortic or pulmonary allograft on the RVOT for different congenital or acquired aortic valve diseases or other congenital cardiac malformations, have been analysed during the follow-up (FU) period. All patients included in this study were discharged in a good condition after the EHB cryopreserved allograft implantation, after the postoperative echography control revealed satisfactory results of the allograft. All patients were separated in two groups: patients with aortic disease of different aetiology, treated with Ross-operation (group one, n = 51) and the patients with different congenital cardiac malformations, receiving the allograft on the RVOT, the non-Ross group (group two, n = 123). In both groups the RVOT was reconstructed by means of the EHB cryopreserved pulmonary or the aortic allograft. In the whole group of the patients, the ABO group matching was not done before the allograft implantation. Analysis of the donor and the recipient blood group was done in the donors’ as well as in the recipients’ files during the FU study. Thirteen patients (25.5%) of group one and 37 (30.08%) of group two had a compatible, whereas 38 (74.50%) of group one and 86 (68.92%) of group two an incompatible ABO group. Mean age was 31.8 years (range 3–55 years) for group one and 26.2 years (range 0–35 years) for group two, with a rate male/female of 3/1 for group one and 3.5/1 for group two. The information about the allograft donor type, the quality assessment in the EHB and the information about thawing and dilution were sent to the implanting surgeon, together with the allograft. Information about the implantation difficulties was required from the implanting surgeon, as well as the complications during the