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Inicial experience using valved porcine xenografts in the rigth ventricule outlet for congenital anomalies

Experiência inicial da utilização do xenoenxerto valvado porcino na via de saída do ventrículo direito em cardiopatias congênitas

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In spite of the advances achieved in congenital anomaly surgery, an adequate substitute for the pulmonary trunk and valve has not been found. Many valvar conducts are attained using tissues fixed in glutaraldehyde, which has a cytotoxic action resulting in an immunogenic reaction limiting good long-term results due to inflammation, thrombosis and calcification [1]. Porcine valvar xenografts fixed using the glutaraldehyde technique have been widely used worldwide and present with variable middle- and log-term results with between 4.2% and 35% of patients being submitted to reoperations due to xenograft valve dysfunction [2]. The utilization of cryopreserved aortic and pulmonary homografts for the reconstruction of the right circulation is common. Homograft dysfunction can also occur with this valved conduit, with the necessary of reoperation for its replacement. Immunologic mechanisms and not just a simple lack of growth are involved in graft failure in these cases [3]. Bioprostheses obtained by tissue engineering utilizing biodegradable frameworks present limitations because of their rigidity and high porosity [4]. Recently, bovine jugular veins with the native valve have been used with good immediate and middle-term results [5]. This graft presents with a compatible texture when anastomosed to pulmonary arteries in newborn babies. Glutaraldehyde is utilized in its preparation and thus all the consequences of this, as previously mentioned, will be seen in the patient's evolution. Isolated decellularization of homografts is still in the initial phase of study, but this may be another option to minimize degeneration of this graft [6].

Based on experimental studies, the utilization of L-Hydro valved porcine xenografts (PVX) in the pulmonary position of newborn lambs, where growth of this graft with preservation of the valve function was demonstrated, clinical studies in children with congenital anomalies and alterations of the right ventricle outflow tract were begun.

The L-Hydro method of preservation initially consists of the use of 50% alcohol to preserve and transport the grafts. Following this, the grafts are treated in a solution containing sodium chloride, polyethyleneglycol, hydrogen peroxide, sodium phosphate and indomethacin at a temperature of between 4ºC and 8ºC. At the end of this treatment, the sodium chloride, polyethyleneglycol, hydrogen peroxide and sodium phosphate are removed and the final product is preserved in 50% alcohol (Figure 1).

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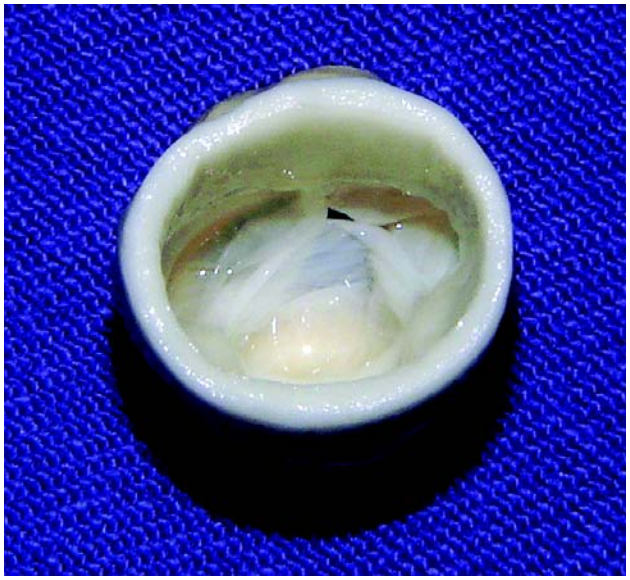

Fig. 1 – Aspect of the porcine valve xenograft treated with L-Hydro prior to implantation

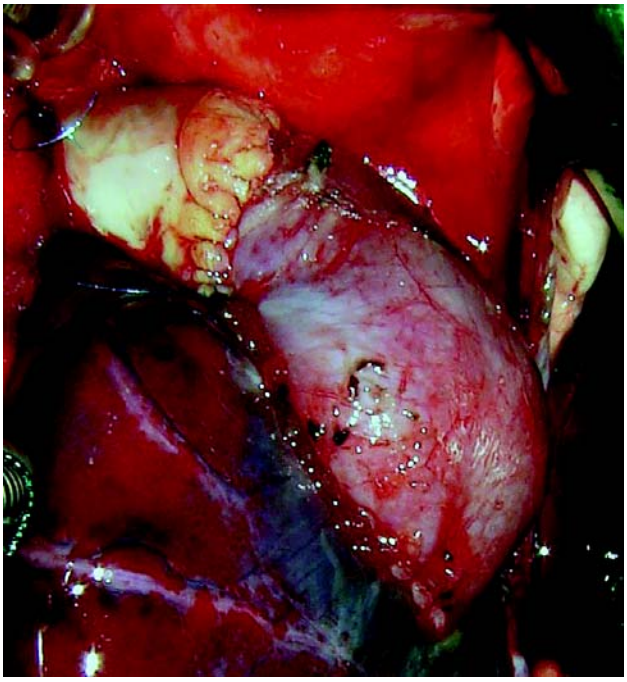

Fig. 2 – L-Hydro porcine xenograft implanted in the right ventricle outflow tract and enlarged using fresh autologous pericardium

L-Hydro valved porcine xenografts were used in three children: Patient 1 – A one-month-old child weighting 3.5 kg with tetralogy of Fallot was submitted to the closing of a interventricular communication (IVC) and the placement of a 11-mm valved porcine xenograft in the pulmonary position (Figure 2). Patient 2 – A ten-month-old child weighting 7 kg with tetralogy of Fallot was submitted to interventricular communication repair with the placement of a 15-mm valved porcine xenograft in the pulmonary position. Patient 3 - A four-month-old infant weighting 3.3 kg with pulmonary atresia and type-A interventricular communication was submitted to interventricular communication repair with the placement of a 13-mm valved porcine xenograft in the pulmonary position.

The evolutions of the three children in the intensive care unit and on the ward were uneventful and they were discharged from hospital in good clinical conditions. Colored Doppler examinations performed in the immediate postoperative period showed excellent results, with good functioning of the valve graft.

Based on this initial group, a study protocol with comparative measurements of size and functionality of the valved porcine xenograft was established.

The clinical evolution of the patients was satisfactory and providing basis for a multicentric study aiming at evaluating this new type of valved graft, that has a potential for growth. The good preliminary immediate results must be reproduced using a larger number of patients and followed up over the middle- and long-terms to reach a definitive conclusion on the possible of using this graft.

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