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Title: Customized Expandable Polyurethane Stent Valve, implanted by catheter. Strategies for Pulmonary Artery approach

Miguel Maluf. MD, PhD; Alfredo A. Rodrigues. MD.
Surgical Endovascular Center - Hospital Alemão Oswaldo Cruz – São Paulo, Brasil

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Biography

Dr. Miguel Angel Maluf was born in Córdoba, Argentina in 1950. He has graduated from Universidade Nacional de Córdoba, Argentina and become a medical doctor in 1973.

Dr. Maluf did specalization in Cardiovascular Surgery at Instituto do Coracao (INCOR) – São Paulo, Brazil. His Surgical Fellowship training was finished by defending the Master's, Dosctoral and Postdoctoral thesis, in the Cardiovascular Division at Universidade Federal de São Paulo, Brazil. He research includes development of several models of biological cardiac prosthetic to remodeling of the right ventricle outlet tract, in congential heart disease.

Abstract

Background: Patients with tetralogy of Fallot, undergoing Right Ventricular Remodeling, in childhood, with or without pulmonary valve reconstruction, evolve, in the late follow-up, with pulmonary insufficiency and Right Ventricular dysfunction, requiring the implantation of a pulmonary prosthesis.

The anatomical variations of the pulmonary artery, associated with the presence of calcifications, dilations, or stenosis as a result of surgeries performed, require adequate planning in the surgical approach for Transcatheter Pulmonary Valve Replacement - TPVR.

Material: A new Expandable Polyurethane Stent Valve, implanted by catheter, in pulmonary position has been developed and approved in Biocompatibility, Physical, Hydrodynamic, Fatigue, Experimental, and Ultrastructure Study of explanted sheep prostheses after 24 months of follow-up, analysis, following ISO 5840-3, 2015 1

Method: In a group of 43 adult patients, in the late follow-up of surgical correction of Tetralogy of Fallot, with late follow-up, at São Paulo Federal University, with an indication for TPVR, they were classified into 6 groups according to the anatomical aspects of the pulmonary artery, analyzed by CT **Angiography:**

Type.1: Pulmonary valve insufficiency (PVI) (7 pat.)

Type.2: PVI + pulmonary trunk stenosis (8 pat.)

Type.3: PVI + pulmonary trunk aneurysmal dilation (15 pat.)

Type.4: PVI + PT + RPA + LPA – stenosis (6 pat.)

Type.5: Pulmonary prosthesis dysfunction (5 pat.)

Type.6: RV-PA Conduit disfunction (4 pat.)

Result: hrough post-processing images by CT Angiography, it was possible to enlarge them to their natural size, followed by 3D printing, in elastic and transparent plastic mass, keeping the interior of the hollow cardiac cavities.

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Custom prosthesis manufacturing: 3 transverse diameters (TD) are measured: TD1: At the level of the Pulmonary Ring; TD2: In the middle third of the TP and TD3: At the level of the origin of the pulmonary arteries. Also, a longitudinal measure (LM), allows for knowing the length of the prosthesis: The distance between the Pulmonary ring and the origin of the pulmonary arteries.

Patients older than 7 years are treated with interventional hemodynamic procedures: G1: TPVR procedure. G2, G3, and G6: Double Sent Valve Technique, is performed. After implanting in the same surgical procedure, a cylindrical stent is firstly implanted to correct the lesions in the pulmonary trunk and then the valve stent is implanted inside the cylindrical stent. In G4, as well as in patients under 7 years of age, valve stent implantation is performed by surgical approach; the correction of defects is made with synthetic material, such as a Polytetrafluoroethylene (PTFE) prosthesis or Polyurethane membrane, followed by implantation of a cylindrical stent. G5: Valve in valve procedure is indicated.

Conclusions: Programmed expansion of stent valves with PU leaflets, calcification resistance, and resistant to fatigue tests, is expected to reduce the number of reoperations in pediatric patients.