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

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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<sup>1</sup>

**Method:**

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

Tipe.1: Pulmonary Valve Insufficiency (PVI)

Tipe.2: PVI + Pulmonary Trunk (PT) stenosis

Tipe.3: PVI + PT aneurysmal dilation

Tipe.4: PVI + PT + Right Pulmonary Artery (RPA) + Left PA (LPA) stenosis

Tipe.5: Pulmonary prosthesis dysfunction

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

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 knowing the length of the prosthesis: 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:**

Expandable stent valves with PU leaflets, calcification resistance is expected to reduce the number of reoperations in pediatric patients.

**References:**

Miguel Maluf et al. Expandable Polyurethane Stent Valve, implanted by catheter. Results of Physical, Hydrodynamic, animal, and structural studies. International Journal Innovation Science and Research Technology, March 2021, 6 (3): 354-9

**Biography**

Dr. Miguel Angel Maluf is an Associate Professor of Cardiovascular Surgery and is the Chief of Pediatric Heart Surgery at Sao Paulo Federal University.

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