Selective propensity of bovine jugular vein material to bacterial adhesion and impact of percutaneous pulmonary valve implantation procedural steps in the genesis of infective endocarditis: an in-vitro study

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Introduction: Percutaneous pulmonary valve implantation (PPVI) using bovine jugular vein made Melody valve is safe and effective. However, infective endocarditis have been reported for unclear reasons. We sought to assess the impact of PPVI procedural steps on valvular histology, selective bacterial adhesion and leaflet mechanical behaviour.

Methods: Three valved stents (Melody valve, homemade stents with bovine and porcine pericardium) were tested in-vitro in 4 conditions: I) control group, II) crimping, III) crimping + inflation of low-pressure balloon and IV) condition III + post dilatation (highpressure balloon). For each condition, valvular leaflets (and venous wall sample for Melody stents) were taken for histological analysis, bacterial adhesion using Staphylococcus aureus and Streptococcus sanguinis strains and mechanical uniaxial tests of valve leaflets.

Results: Among Melody valves, incidence of transverse fractures was significantly higher in traumatized samples compared with control group (p<0.05) whereas, incidence and depth of transverse fractures were not statistically different between the 4 conditions for bovine and porcine pericardial leaflets. Bacterial adhesion was higher on bovine jugular venous wall for S. aureus and on Melody valvular leaflets for S. sanguinis in control groups and significantly increased in traumatized Melody valvular leaflets with both bacteria (I vs IV: p=0.05). Figure 1 shows scanning electron microscopy evidence bacterial adhesion of S. sanguinis on Melody valve leaflet (white arrow). Bacterial adhesion was lower on bovine pericardial leaflets.

Conclusions: Valved stent implantation procedural steps induce histological lesions on Melody valve leaflets. Adhesion of S. aureus and S. sanguinis pathogenic strains to Melody valve components was noted on safe tissue and procedural steps of implantation increased it.

Figure 1