

Valve Competence One Year After Percutaneous Pulmonary Valve Implantation Or Surgical Homograft Implantation Assessed By Magnetic Resonance Imaging

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Introduction

Percutaneous pulmonary valve implantation (PPVI) is an alternative to repeat surgical homograft implantation. Valve competence over time has implications for the need of re-intervention. Many homografts used for congenital heart surgery degenerate and develop regurgitation. We sought to compare their valve competence with PPVI one year following intervention.

Methods

We investigated 32 PPVI patients (Fig. 1A) and 25 patients, who underwent homograft implantation (Fig. 1B) in the pulmonary position (Table 1). One year following intervention, the pulmonary valve competence was assessed using magnetic resonance (MR) imaging. Pulmonary flow was calculated from the phase-contrast images (Fig. 2A) and the regurgitant fraction (PRF) was calculated as the percent backward flow over forward flow (Fig. 2B). A PRF of > 20% was judged significant regurgitation. Fisher's exact test was used. A P-value of < 0.05 was considered statistically significant.

Table 1. Patient characteristics.

Parameter	Surgery	PPVI
Age at intervention [years]	21±13	23±11
<i>Principal Diagnosis</i>	<i>Patient number</i>	
Tetralogy of Fallot variants	24	16
TGA*, pulmonary stenosis, VSD#	0	4
Truncus Arteriosus	0	5
Other (e.g. patients after Ross procedure)	1	7

*TGA=Transposition of Great Arteries, #VSD=Ventricular Septal Defect

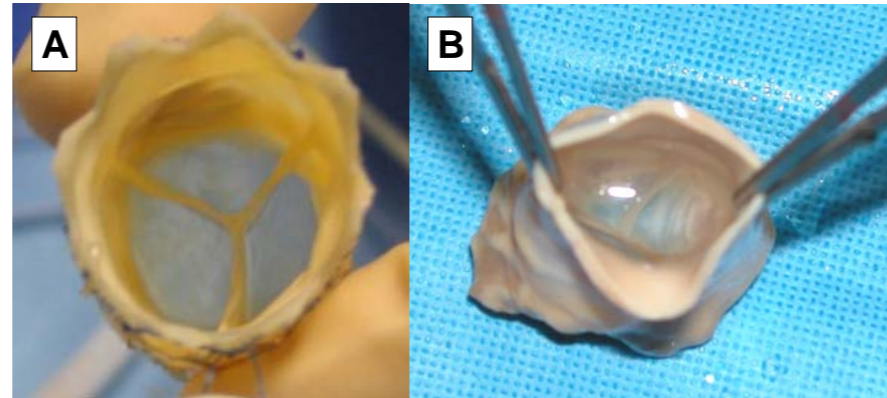


Figure 1. A: Fixed relative leaflet position in PPV stent. B: Homograft prior to implantation.

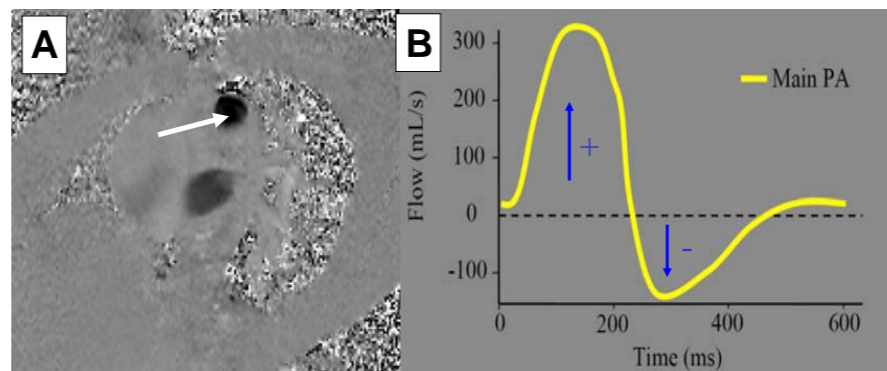


Figure 2. A: Phase-contrast MR image of a patient with significant pulmonary regurgitation, indicated in black (arrow). B: Representative mapping of pulmonary flows.

Results

One year following intervention, more patients in the surgical group had significant pulmonary regurgitation compared to the PPVI group (P=0.013, Table 2, Figure 3).

Table 2. Comparison of significant PRF, surgery versus PPVI

	PRF < 20%, 1 year post intervention	PRF > 20%, 1 year post intervention	P-Value
Surgery	20 patients	5 patients	0.013
PPVI	32 patients	0 patient	

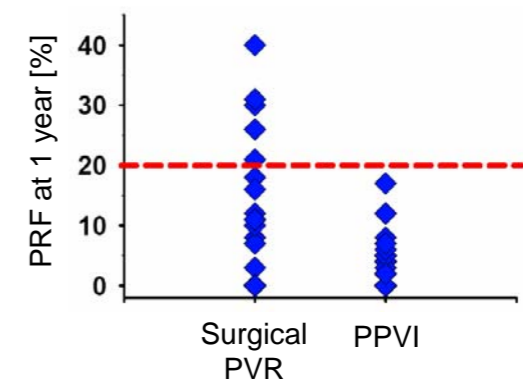


Figure 3. There was a high variability in PRF in the surgical population at one year.

Conclusions

- ✦ Significant pulmonary regurgitation is common in surgical patients, one year following homograft implantation.
- ✦ Valve incompetence in this population is likely due to distorted homograft valves in complex anatomy.
- ✦ The leaflet mobility of the bovine jugular vein used in PPVI leads to superior competence at one year.
- ✦ Further studies will show, whether homograft valves, which had good competence at one year, have better longevity compared to bovine tissue valves.