

P17. Quantitative Analyses Of Stent Elasticity For Commissural Attachments

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OBJECTIVES: Little is known about the stent elasticity required for optimal valved stent design, therefore we studied two well established biological heart valve substitutes with long term follow-up.

METHODS: We used Medtronic Intact 705 size 27 mm and Carpentier-Edwards (CE) 6625 size 27 mm mitral bioprostheses with three sonomicrometry probes (Sonometrics Corp., London, Ontario, Canada) fixed at commissure attachment points. Our test system consisted of a valve mounting chamber and a pressurizing roller pump. Mean values from 2400 data points from 3 measurements of the interprobe distances were used to calculate the radius (R) of the circle circumscribed around the 3 probes (see fig. 1). We compared these data with the circumferential compliance at the level of commissures of a porcine aortic root harvested within 6 h post mortem. Student's t-test was used for statistical comparisons.

RESULTS: Results are summarized in table 1. We compared the changes in R of the aortic root at pressures 80-100 mmHg and 110-150 (pressure during diastole and systole) with that of the stent posts at 80-100 mmHg and at 0 mmHg (transvalvular pressure gradient during diastole and systole) and found R to increase from diastole to systole by 8.76%, 8.7% and 3.87% for porcine aortic root, CE and Intact valves respectively.

CONCLUSIONS: Elastic properties of the CE valve stent are similar to native porcine aortic wall while Intact valves are more stiff ($p < 0.001$). Flexible stent material minimizes tissue stress, but apparently a ~4% radial flexibility is also enough judged by the good long term results of Intact valves.

Table 1

Tested object	Pressure, mmHg	R, mm	R, % of 0 mmHg
CE	0-10	7.99	100
CE	80-100	7.35	91.99
CE	110-150	7.20	90.11
CE	190-240	6.90	86.36
Intact	0-10	7.24	100
Intact	80-100	6.97	96.27
Intact	110-150	6.85	94.61
Intact	190-240	6.63	91.57
Porcine aortic root	0-10	11.64	100
Porcine aortic root	80-100	14.38	123.54
Porcine aortic root	110-150	15.40	132.30
Porcine aortic root	190-240	16.30	140.03

Positioning of sonomicrometry cristals

