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St. Jude EPIC Heart Valve Bioprostheses Vs. Native Human And Porcine Aortic Valves - Differences In Biomechanical Properties

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Objectives:

To determine the mechanical properties of *EPIC* bioprostheses made from chemically treated porcine aortic valves (AoV) and to compare them with native human and porcine AoV.

Method:

Leaflets from 8 porcine AoV and 3 *EPIC* bioprostheses were analysed using uniaxial tensile tests in radial and circumferential directions. Mechanical properties of human AoV have been previously published by our group. Results are represented as mean values \pm standard deviation.

Results:

EPIC bioprostheses have the highest modulus of elasticity (E) values at the level of stress 1.0 MPa in both tested directions. Ultimate stress in circumferential direction is highest for *EPIC* bioprostheses: 6.84 ± 0.66 MPa, human valves have 1.74 ± 0.29 and porcine - 1.58 ± 0.26 MPa, respectively. Ultimate strain in circumferential direction is 18.35 ± 7.61 % for human valves, 7.26 ± 0.69 % for porcine valves and 5.15 ± 0.61 % for *EPIC* bioprostheses. In both directions there is a marked shift to the stress axis of the stress/strain curve for *EPIC* bioprostheses compared to native valves.

Conclusions:

EPIC bioprostheses are significantly stiffer compared to native porcine and human AoV as judged by a shift to the stress axis in the stress/strain curves, higher E and lower ultimate strain. Reported biomechanical properties of normal human and porcine AoV, and *EPIC* bioprostheses provide important information on current bioprostheses and an important insight for heart valve tissue engineering.