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Differential tissue mass distribution and water content in different sectors of aortic and pulmonary valved conduits before and after detergent-based decellularization

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Objectives:

Owing to limited information concerning relationship between mechanical performance and quantitative distribution of matrix components in heart valves we investigated in detail tissue mass distribution and water content within leaflet, sinus and proximal wall segment of aortic (AR) and pulmonary artery root (PR).

Method:

Water content, lipid distribution and full dry weight of extracellular matrix components was determined in sectors of pig AR and PR before and after detergent-based decellularization procedure (Tri-Col).

Results:

Water content was different between all sectors of AR and PR. It accounted to 72 % in aortic wall vs 78% of pulmonary trunk while relevant hydration of leaflet resulted higher in aortic than in pulmonary one (92% vs 89%, respectively). Moreover, thickness difference between AR and PR leaflet appeared mostly related to hydration than to different mass of structural components. Detergent based decellularization did not sensibly affect distribution of dry mass in AR while it resulted in significant loss of tissue fractions in case of PR. Free water was significantly higher in PR wall.

Conclusions:

Distribution of unstable tissue components was different also among different pulmonary leaflets. Moreover as different hydration of native AR and PR sectors was maintained at completion of decellularization such differences were related almost exclusively to differential organization of extracellular matrix components. Structural arrangement of such components appeared to be much more stable in AR than that in PR.