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Research of Biomechanical Properties of Glutaraldehyde - Treated Human Pericardium.

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Objectives:

Pericardium is commonly used for repair of congenital heart defects. Autologous pericardium can be used in its fresh state, either pedicled or as a free graft, or it can be used as a free graft after fixation with glutaraldehyde solution. There are not many studies about changes of biomechanical properties of human pericardium after treating with glutaraldehyde at the time of operation. There are controversial opinions between surgeons about using of chemical harvesting of pericardium. The aim of this experimental study is to investigate changes of biomechanical properties of human pericardium after harvesting with glutaraldehyde solution.

Method:

The protocol of the study was approved by ethics committee. The pericardium was fixed with 0.2% solution of glutaraldehyde for 6 minutes. Thickness of the samples of pericardium was measured by cathetometer KM-6 LOMO. For investigation of biomechanical properties uniaxial tensile tests were performed with testing machine Zwick-Roell Z010 and data processing software package Testexpert 11.02. was used. There were set up 18 pieces of fresh human pericardium and 11 pieces of glutaraldehyde-treated human pericardium. Force - elongation curves were recorded at elongation rate 5 mm^{-1}

Results:

There is difference ($p < 0,05$) of ultimate strain (ϵ_{\max}), ultimate stress (σ_{\max}), tangential modulus of elasticity (E) between fresh pericardium $\epsilon_{\max} = 0,110 \pm 0,037$, $\sigma_{\max} = 3,14 \pm 0,70$ MPa, $E = 98.67 \pm 20.75$ MPa and glutaraldehyde treated pericardium $\epsilon_{\max} = 0,098 \pm 0,015$, $\sigma_{\max} = 6,20 \pm 1,47$ MPa, $E = 50.25 \pm 16.04$ MPa, respectively.

Conclusions:

Treating with glutaraldehyde improve the application of autologous human pericardium as the plastic material for surgical repair of congenital heart anomalies.