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Is there a histological difference between aortic and pulmonic tissue engineered scaffolds?

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Objectives:

Tissue engineering is a promising approach to overcome the problems associated with biological heart valve prosthesis. The key point for creating a tissue engineered heart valve is finding the optimal scaffold. Therefore we investigated the difference between aortic and pulmonic scaffolds.

Method:

In this study 30 Lewis rats were investigated using the rat subcutaneous model. All animals survived without complications during follow-up. We implanted in each of the rats four scaffolds: one decellularized aortic, one undecellularized aortic, one decellularized pulmonic and one undecellularized pulmonic tissue specimen. From respectively 10 rats we explanted the scaffolds after two, four and six weeks. Afterwards Haematoxylin/Eosin Staining, Von Kossa Staining and staining for CD-68 positive cells was performed and a semi quantitative evaluation was conducted.

Results:

Histological evaluation showed a significant decrease ($p<0.05$) of inflammatory reaction after decellularisation in aortic and pulmonic scaffolds. Also significantly less inflammatory response ($p<0.05$) could be seen in the aortic tissue compared with the pulmonic tissue. The strongest inflammatory reaction could be seen after 2 weeks, declining after four and six weeks. The inflammatory response was confirmed by staining for CD 68 positive cells (monocytes/macrophages). Furthermore the Von Kossa staining revealed no signs of calcification in the decellularized scaffolds.

Conclusions:

These results indicate that decellularization reduces the inflammatory response and the potential of calcification of pulmonic and aortic scaffolds. But pulmonic scaffolds show even if decellularized a higher inflammatory potential than aortic scaffolds.