

Rechnergestützte Ventrikuloplastik Computer-aided ventriculoplasty

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With the large number of patients having advanced heart failure and the small number of patients for whom heart transplantation will be available, interest in left ventricular reduction has intensified in recent years. Laplace's law, the relationship between chamber diameter and wall stress, is cited as one of the physical principles underlying the potential benefits of volume reduction. Such operations involve the removal of a portion of the ventricular wall. It has been suggested that ventricular volume reduction surgery can reconstitute stress-strain relations of the left ventricle. Based on a cylindrical model of the left ventricle, regional force-length relationships were computed to predict the effects of volume reduction. Free wall plication, a recently developed operation method for ventricular reduction was performed in dogs with pacing induced heart failure. Intraoperative pressure-volume analysis was performed by the conductance catheter technique and regional force-length relationships were calculated to achieve optimal reshaping of the left ventricle. Computer simulation showed that any reduction of circumferential length lead to reduced chamber size, and a leftward shift of both systolic and diastolic force-length relationships. Computer-assisted volume reduction led to optimized ventricular reshaping and increased systolic force-length relationships and thereby myocardial contractility. Thus, computer modelling allowed the optimization of preoperative planning and maximalizing force-length relationships intraoperatively. Furthermore, free wall plication can be performed without cardiopulmonary bypass and thereby provides a less invasive approach for ventricular reconstruction.