

# **A cooled intraesophageal balloon to prevent thermal injury during endocardial surgical radiofrequency ablation of the left atrium: a finite element study.**

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## **Author information**

### **Abstract**

Recent clinical studies on intraoperative monopolar radiofrequency ablation of atrial fibrillation have reported some cases of injury to the esophagus. The aim of this study was to perform computer simulations using three-dimensional finite element models in order to investigate the feasibility of a cooled intraesophageal balloon appropriately placed to prevent injury. The models included atrial tissue and a fragment of esophagus and lung linked by connective tissue. The lesion depth in the esophagus was assessed using a 50 degrees C isotherm and expressed as a percentage of thickness of the esophageal wall. The results are as follows: (1) chilling the esophagus by means of a cooled balloon placed in the lumen minimizes the lesion in the esophageal wall compared to the cases in which no balloon is used (a collapsed esophagus) and with a non-cooled balloon; (2) the temperature of the cooling fluid has a more significant effect on the minimization of the lesion than the rate of cooling (the thermal transfer coefficient for forced convection); and (3) pre-cooling periods previous to RF ablation do not represent a significant improvement. Finally, the results also suggest that the use of a cooled balloon could affect the transmuralty of the atrial lesion, especially in the cases where the atrium is of considerable thickness.