Continuous monitoring of pulmonary vein conductivity using a novel circular mapping catheter during cryoballoonablation

M. L. Koller[1], A. Schade[1], A. Langbein[1], S. Spehl[1], B. Schumacher[1]

[1]Klinik für Kardiologie, Herz- und Gefäß-Klinik GmbH, Bad Neustadt a. d. Saale;

Background:

Cryoballoonablation of pulmonary veins (PVs) has recently been introduced as an effective and safe interventional treatment option for patients with symptomatic paroxysmal atrial fibrillation. Here, we report our initial experience with a novel thin-caliber (0.9 mm shaft diameter) circular mapping catheter (ProMap®) that allows for continuous monitoring of PV conductivity during cryoballoonablation.

Materials and Methods:

PV cryoablation with the 28 mm Arctic Front® cryoballoon was perfomed in 7 consecutive patients with symptomatic paroxysmal atrial fibrillation. Continuous monitoring of PV conductivity was performed by introducing the ProMap® circular mapping catheter through the inner lumen of the Arctic Front® cryoballoon catheter into the PV distal to the balloon occlusion site. Cryoablation time to PV disconnection, minimally obtained cryoablation temperature and highest grade of PV occlusion (as determined on a semiquantitative scale from 1 being poorest to 4 being optimal occlusion) were recorded. At the end of the procedure PV isolation was re-checked in all PVs using a conventional circular mapping catheter.

Results:

Before the onset of cryoablation distinct PV potentials were recorded in 16 of 28 PVs using the ProMap® circular mapping catheter. In the remaining 12 PVs, no PV potentials were seen because the position of the ProMap® catheter was too distal inside the PV and the design of the ProMap® and/or the Arctic Front® catheter prevented a more proximal position. In the 16 PVs with distinct PV potentials, mean (± SD) time to PV disconnection during cryoballoonablation was 90 ± 96 sec (range 10 – 350 sec). Lower cryoablation temperatures and higher grades of PV occlusion were correlated with shorter cryoablation times to PV disconnection. In 9 of 16 PVs, PV disconnection during cryoballoonablation was preceded by progressive PV conduction delay, in 5 PVs immediate conduction block occurred without preceding conduction delay and in the remaining 2 PVs isolation could only be achieved after “crosstalk” ablation of the ipsilateral PV. We observed 2 instances of early PV reconnection during the thawing phase of cryoballoonablation. In both cases persistent PV isolation was achieved by additional cryoballoonablations.

Conclusion:

Continuous monitoring of PV conductivity using the ProMap® circular mapping catheter is feasible and provides important information on the physiology and effectiveness of PV cryoballoonablation. Modifications in the design of both the ProMap® circular mapping catheter and the Arctic Front® cryoballoonablation catheter are required to enable a more proximal positioning of the mapping catheter within the PV during cryoballoonablation.