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CONTROL OF LESION SIZE BY SETTING A TARGET TEMPERATURE DETERMINED FROM A PRE-ABLATION LOW POWER TEST PULSE DURING IN VIVO IN RADIOFREQUENCY ABLATION

N. Stagegaard, H. Hogh Petersen, L. Ram lose, X. Chen, J. Hasstrup Svendsen.

Purpose: To develop and test an algorithm allowing determination of the target temperature necessary to approach a desired lesion size, allowing creation of a more controllable lesion size during radiofrequency ablation in vivo.

Methods: Experimental model: Left ventricular ablation was performed in anesthetized pigs using a 7F 4 mm tip catheter, and a generator with a maximum power-output of 100 W. After final positioning of the catheter a low power test pulse (0.6 W for 5 s) was applied and ablation was then performed in the temperature-controlled mode for 60 s. The animals were sacrificed two hours after ablation. Lesion volume was determined by staining with nitroblue tetrazolium, bisecting and measuring maximum depth and width.

Development of the algorithm: AT was measured and temperature-controlled ablation was then performed at target temperatures of 60 and 70°C and volume calculated. A parabolic regression analysis was performed and the curves extrapolated to target temperatures from 55-85°C.

Testing the algorithm: A target volume of 300 mm³ was tested by measuring AT and subsequently ablating with the target temperature determined by the algorithm to approach the target volume.

Results: In 12 pigs 34 lesions was performed to calculate the algorithm. AT ranged from 0.2-2.2°C and volume from 13-1440 mm³. The parabolic regression analysis yielded τ=0.95 and τ=0.74 for 70°C and 60°C target temperature respectively.

Testing was performed in 6 animals, with a total of 35 lesions. AT ranged from 0.2-2.2°C target temperature range from 62-85°C and mean lesion volume was 310±93 mm³. The spread on this lesion volume was significantly smaller (p<0.02) than the spread on lesion volume for a target temperature of 70°C.

Conclusions: The temperature rise to a pre-ablation low power test pulse is a valuable measure for evaluating the impact on lesion size of electrode tissue contact. An increase in lesion size may be achieved in order to approach a desired lesion size, allowing creation of a more controllable lesion size during radiofrequency ablation in vivo.

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EVALUATION OF ELECTRODE-TISSUE CONTACT AND IMPACT OF CAVITARY COOLING DURING TEMPERATURE-CONTROLLED RADIOFREQUENCY CATHETER ABLATION IN VITRO

N. Stagegaard, H. Hogh Petersen, L. Ram lose, X. Chen, J. Hasstrup Svendsen.

Purpose: To be able to predict lesion size prior to RF ablation by using two parameters. 1. A Temperature-rise to a low-power test pulse reflecting cavitary cooling 2. An impedance-rise caused by the actual obtained electrode position reflecting electrode-tissue contact.

Methods: Strips of left ventricular porcine myocardium were suspended in a tissue bath of isothnic saline. External convective cooling around the tip was created by a pump circulating the saline at a velocity of 0 or 0.10 m/s. The electrode tip was mounted in a perpendicular position adjusted to a pressure of 10 or 30 gram. Impedance was measured before and after electrode-tissue contact at 50 kHz and the temperature-rise was measured for a low power test pulse (0.16 W for 30 s) prior to each application. Ablations were subsequently performed with a 7F 4 mm tip catheter for 60 s, temperature-controlled with a target of 70°C under unchanged conditions.

Results: A total of 40 lesions were created in 5 groups.

Pressure External Cooling ΔMP ΔT Power Volume

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<tr>
<td>10</td>
<td>0</td>
<td>21.7</td>
<td>3.10.5</td>
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<tr>
<td>30</td>
<td>0</td>
<td>33.14*</td>
<td>4.11*</td>
<td>11.15</td>
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<tr>
<td>20</td>
<td>0.1</td>
<td>30.113</td>
<td>0.010.1*</td>
<td>30.110*</td>
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<tr>
<td>G</td>
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Values are expressed as mean±SD, (p<0.05). For increasing pressure ΔMP and ΔT increased significantly (p<0.05). For increasing cooled ΔT decreased significantly, whereas ΔMP was unchanged. Both parameters reflected significant changes in power and for increasing cooling also a significant increase in lesion size.

Conclusion: In vitro AIMP reflects electrode-tissue contact pressure and AT reflects both the cooling and the pressure. These two parameters correlate to the power output needed and ΔT is negatively correlated to lesion size for temperature-controlled ablation.

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USEFULNESS OF ADENOSINE TEST IN DIAGNOSIS OF SINUS NODE DYSFUNCTION

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The aim of study: Evaluation of rapid injection of adenosine usefulness in diagnosis of sinus node dysfunction (SND) in coronary disease patients.

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