Arrhythmias - Catheter Ablation of Arrhythmias

Optimized radiofrequency lesions through local impedance guidance for effective cavo-tricuspid isthmus ablation in typical right atrial flutter: data from the CHARISMA registry

Ducceschi V.[1]; Carbone A.[2]; Botto G.[3]; Nigro G.[4]; Lavalle C.[5]; Infusino T.[6]; Maglia G.[7]; Nicolis D.[8]; Zingarini G.[9]; Del Giorno G.[2]; Brasca F.[3]; Rago A.[4]; Auricchio C.[10]; Malacrida M.[10]; Sangiuolo R.[1]

[1]Fatebenefratelli Hospital, Naples, Italy
[2]Maria SS Addolorata Hospital, Eboli, Italy
[3]Rho Hospital, Rho, Italy
[4] AO dei Colli-Monaldi Hospital, Naples, Italy
[5]Umberto I Polyclinic of Rome, Rome, Italy
[6]S.Anna Hospital, Catanzaro, Italy
[7]Azienda Ospedaliera Pugliese-Ciaccio, Catanzaro, Italy
[8]Hospital Carlo Poma, Mantova, Italy
[9]Hospital Santa Maria Della Misericordia, Perugia, Italy
[10]Boston Scientific Italy, Milan, Italy

Funding Acknowledgements: Type of funding sources: None.

Background: Radiofrequency (RF) catheter ablation of the cavo-tricuspid isthmus (CTI) is an established treatment for typical right atrial flutter (RAFL). However, whether local tissue impedance (LI) is able to predict effective CTI ablation and what LI drop values during ablation should be used to judge a lesion as effective remains to be established.

Purpose: We aimed to investigate the ability of LI to predict ablation efficacy in patients (pts) with RAFL and to characterize the CTI in terms of LI.

Methods: Consecutive pts undergoing RAFL ablation from the CHARISMA registry were enrolled at 9 centers. A novel RF ablation catheter with dedicated algorithm (DirectSense - DS -) was used to measure LI at the distal electrode of this catheter. RF applications (RFC) were targeted to a minimum LI drop of 10 Ω within 30 seconds and were stopped when a maximum cutoff LI drop of <40 Ω was observed. Successful single RFC was defined according with a split in two separate potentials (SPL), reduction of voltage (RedV) by at least 50% or changes at unipolar EGM (UPC). Agreement among criteria was evaluated. Ablation endpoint was the creation of bidirectional conduction block (BDB) across the isthmus.

Results: A total of 279 ablation spot lesions were delivered in 30 pts (mean RFC 9 ± 6 lesions per pt): 106 (38%) at anterior, 115 (41%) at mid and 58 (21%) at posterior portions of the CTI. BDB was obtained in all cases and no complications were observed. The median RFC delivery time was 30 [19–45] seconds per lesion. 132 (47%), 150 (54%) and 86 (31%) ablation spots were effective according with SPL, RedV and UPC, respectively. Complete agreement of all the criteria was reached in 70% of the cases. The mean LI was 104.4 ± 11Ω prior to ablation and 92.1 ± 11Ω after ablation ($p < 0.0001$, mean absolute LI drop 12.2 ± 7Ω, mean time to LI drop 13 ± 8 seconds). Effective ablation spots showed a higher LI drop compared with ineffective sites at each single criteria (16.6 ± 7Ω vs 8.3 ± 4Ω for SPL, $p < 0.0001$; 16.1 ± 6Ω vs 7.8 ± 5Ω at for RedV, $p < 0.0001$; 19 ± 6Ω vs 9.2 ± 4Ω for UPC, $p < 0.0001$) and LI drop values significantly increase according to the number of criteria satisfied (ranging from 7.5Ω % -no criteria- to 19.1 -all criteria-). A 15Ω cut-off value for LI (AUC 0.91, sensitivity = 67%, specificity = 92%, $p < 0.0001$) was associated with the achievement of all criteria with an OR of 21.9 (95%CI: 11.1 to 43.5, $p < 0.0001$) and a positive predictive value of 76%. Starting LI and LI drop seem to be higher at mid-septal areas.

Conclusion: In our preliminary experience, a LI-guided approach of CTI seems to be safe and effective in RAFL ablation. The magnitude of LI drop was associated with effective lesion formation and conduction block and could be used as a marker of ablation efficacy.