Quantification of the Parasympathetic Modulation by Extracardiac Vagal Stimulation during Cryoballoon ablation

Thiago Guimarães Osório
Juan Sieira
Pedro Brugada
Gian-Battista Chierchia
Carlo de Asmundis

Introduction: The cardiac autonomic nervous system (CANS) might play a critical role in the onset and maintenance of atrial fibrillation (AF). The ganglionated plexi (GP), as well as the PV ostia, are richly innervated by both the sympathetic and parasympathetic autonomic systems. Consequently, it is not a surprise that the second-generation cryoballoon (CB-A) ablation can acutely modulate the parasympathetic tone. Pulmonary vein isolation (PVI) has become the most prevalent invasive technique in the treatment of paroxysmal atrial fibrillation (PAF) after the discovery of triggers in the pulmonary veins. According to the literature, modification in CANS activity might be important and apparently desired collateral effect in the setting of PVI. In fact, the appearance of vagal responses (VR), during PVI, commonly witnessed in the left superior pulmonary vein (LSPV), might produce a better long-term outcome. Nevertheless, a detailed analysis of the direct effect on the parasympathetic denervation after ablation of the right or left-sided pulmonary veins (PV) is still unknown. With this goal in mind, we sought to evaluate the contribution of the right or left PVs in the acute vagal denervation after ablation with the CB-A by the means of external cardiac vagal stimulation (ECVS) in 20 patients.

Methods: Twenty consecutive patients, ten starting from the LSPV and ten from the right superior pulmonary vein (RSPV), with drug-refractory symptomatic PAF, having undergone ECVS before the first and after the right or left PVs ablation by means of CB-A ablation were included in this study.

Result: Results: The ECVS performed pre-ablation provoked cardioinhibitory responses in all cases with mean pause duration of 11053.6 ms +/- 3249.6 ms. In the group started from the LSPV, after the ablation of the left-sided PVs the VR were reduced by 23.19 %, 8490.2 ms +/- 1040 ms (p = 0.01) if compared to baseline response. Noteworthy, in the group started from the RSPV, after the right-sided PVs ablation, VR was diminished by 91.8%, 902.7 +/- 271.04 ms (p < 0.001) if compared to baseline response.

Conclusion: Conclusion: Although not directly targeting the ganglion plexuses, AF ablation with the CB-A causes a significant acute parasympathetic denervation. The right side veins showed to be associated with the most significant reduction of acute parasympathetic denervation. This knowledge might also be useful to understand the role of the vagal tone in different heart diseases.