Septal Ablation with Radiofrequency and the Use of New Technologies in Patients with Hypertrophic Cardiomyopathy in an Electrophysiology Laboratory

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Dear Editor,

We have read, with great interest, the article "Septal ablation with catheters and radiofrequency guided by echocardiography for treatment in patients with obstructive hypertrophic cardiomyopathy (OHC): First experience", published recently by Valdigem et al.[1] in the journal *Arquivos Brasileiros de Cardiologia*.

In this study, the authors evaluated the effects of endocardial ablation by radiofrequency (RF) of the interventricular septum with reduction of the ventricular-arterial gradient and improvement in functional class in 12 patients with OHC. Catheters with solid 8-mm tips were used to apply the thermo-controlled RF. The energy intensity was of 80 Watts, with a maximum temperature of 60ºC. The target for ablation was the region with the highest gradient in the left ventricle outflow tract and was identified by the transesophageal echocardiogram. The authors observed an average reduction of the gradients obtained from 96.8±34 mmHg to 36.1±23 mmHg (p=0.0001) during a 1-year follow-up, with a clinical improvement in all patients of the series. They concluded that the septal ablation with RF is an effective, safe strategy and represents a new option to treat OHC patients with high and symptomatic gradients. We would like to congratulate the authors for their fine results in using a technological device that is of easy access, as well as for bringing new and relevant information about the procedure, which is still under development.

From August 2020 to January 2021, our team conducted an ablation with RF of the interventricular septum in two patients (a 44-year-old man and a 38-year-old woman) with symptomatic OHC, who were refractory to clinical treatment, both undergoing follow-up for more than 12 months. However, in contrast to the technique described by Valdigem et al.,[1] we used new imaging techniques, including electroanatomic mapping (EAM) and intracardiac echocardiography (ICE) (Figure 1). The EAM allowed us to define the localization of the intraventricular conduction system and conferred greater safety in the application of RF (avoiding the left bundle branch block or complete atrioventricular block). The geometric construction produced by the EAM of the left and right ventricles also provided important information on the definition of the area to be treated. The ICE allowed us to follow the production of the lesions of RF in the interventricular septum and the evolution of the edema near the left ventricle outflow track during the procedure, without the need for an echocardiographer. Additionally, the ablation with radiofrequency was optimized with the use of irrigated-tipped catheters, and the lesions were controlled by the VISITAG SURPOINT (J&J)[2] software in order to standardize its depth.

The procedure's interruption criteria used by Valdigem et al.[1] was an acute 25% drop in the ventricular-arterial gradient. However, some authors suggest that the excessive septal ablation to reach these indexes can acutely provoke a paradoxical and acute increase of the gradient with the risk of significant pulmonary congestion after the ablation.[3] Our impression is that the use of a purely anatomic strategy, with septal applications directly above the left branch, with an Ablation Index target of between 600 and 700, using an 3.5-mm irrigated catheter (50 Watts and 43ºC) and a continuous evaluation of the edema of the left ventricle outflow tract with the ICE, may well make the procedure safer.

The wide range of series published to date do not give value to the immediate gradient, suggesting that the greatest benefit in the reduction of the gradient occurs between 9 and 12 months of ablation.[4,5] Our patients witnessed a significant reduction of the interventricular gradient, with an average drop from 91±22 mmHg to 27±14 mmHg, approximately 12 months after the initial procedure, and a further reduction in the first post-operative day of 22±6 mmHg, both with a significant improvement in the symptoms. The patient is currently at the functional class II level. The use of an irrigated catheter can cause more predictable lesions, but it can also contribute in treating pulmonary congestion, as described by the authors. The simultaneous use of the ICE to follow up on the RF applications can also prevent the occurrence of *"Stem Pops"*, a common fact in prolonged applications and with high energy. Additionally, the intracardiac echocardiogram aids in monitoring the risk of excessive applications by accompanying the formation of a septal edema. Nevertheless, one of our patients presented a medical condition of immediate pulmonary congestion after the ablation, which was resolved with the use of diuretics and non-invasive ventilation. Both the use of the irrigated catheter as well as the significant

Keywords

Radiofrequency Ablation; Hypertrophic Cardiomyopathy; Electrophysiology.

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edema in the outflow tract may have contributed to the medical condition presented by the patient. Further studies are warranted in order to compare different techniques, as well as to standardize what would be the ideal means through which to create the lesions, which minimize the risk of acute increases in the ventricular-arterial gradient after the ablation.

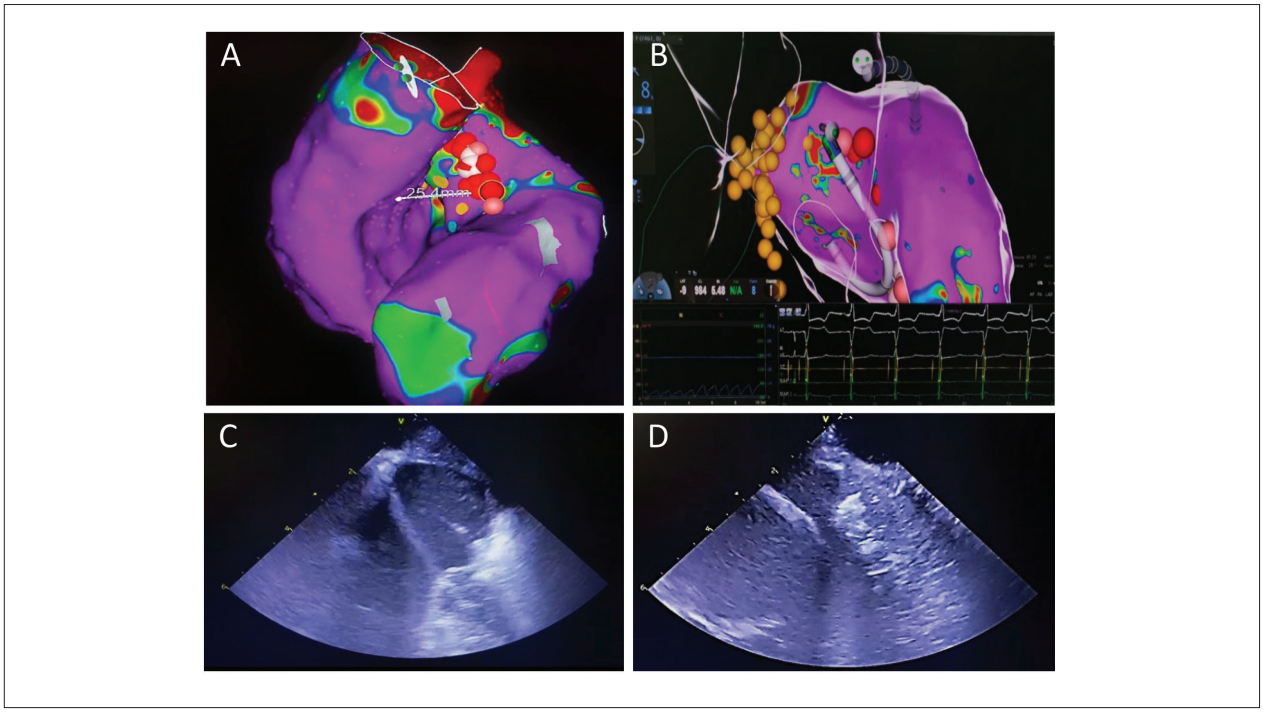

Figure 1 – *Carto 3-guided electroanatomic maps of the right and left ventricle. This picture shows the point with the largest septal thickness (25 mm). The points in red represent the region where the radiofrequency was applied. B) Beginning of the application of radiofrequency. The yellow points represent the areas to be avoided in which the conduction system was identified. C) Hyperechogenicity of the septal region, evaluated continually using the intracardiac echocardiogram during the application of radiofrequency. It is possible to identify the catheter in the strap resting on the septal region. D) At the end of the procedure, an intense edema is observed in the septal region, associated with hyperechogenicity near the left ventricle outflow tract.*

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Reply

Congratulations for your interest in the procedure,[1] we believe that new protocols for ablation and especially for post-operative care should be encouraged, given that even the way of releasing the energy and the localization of the point where the radiofrequency is applied are not a consensus among authors (note that Lawrenz, in a publication in August 2021, presented data with a bilateral application and only in the right septum).[2]

After a careful review of the first 40 cases carried out by our research group (publication pending), we observed that differences related to the morphology of the interventricular septum can be significant in the choice of the location to

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begin the ablation. More homogeneous hypertrophic septa tend to present a migration from the gradient in the apical direction. Thus, the ablation guided only by the anatomy can result in more extensive lesions unnecessarily. Moreover, residual medioventricular gradients can also occur, which would require a second approach.

Another benefit for the use of the transesophageal echocardiogram (TEE) would be the localization of the real point where the gradient began. More often, the gradient begins in the apical region than in the thicker region of the septum, marked by the point of greater aliasing, illustrated by the color flow mapping echocardiogram (Figure 1). The TEE presents images with a better visualization of the left ventricle outflow tract than does the intracardiac echocardiogram, information that is of utmost importance for the adequate alignment of the catheter.

The echocardiographic evaluation differentiates the shapes of valvular obstructions (in aortic stenosis) from the subvalvar obstructions, through the spectral image of the Continuous Doppler (Figure 2). This information is essential in cases of sequential stenosis, as occurs in the cases of septal ablation by pre-TAVI radiofrequency (in which this method has shown a promising role).

Furthermore, the TEE provides information about the adjacent structures, including the application of radiofrequency, enabling the ready identification of possible complications, such as lesions in tendinous cords, or the anterior cusp of the mitral valve.

One of the main parameters of success in the intra-procedure is the reduction in mitral regurgitation, resulting from the reduction in the systolic anterior motion (SAM) of the mitral valve due to the reduction in the obstruction of the left ventricle outflow tract.

Once again, we would like to congratulate the authors for their considerations and for their efforts to simplify the procedure and increase its diffusion. If it should be of your interest, we are willing to participate in joint analyses and sharing of experiences.

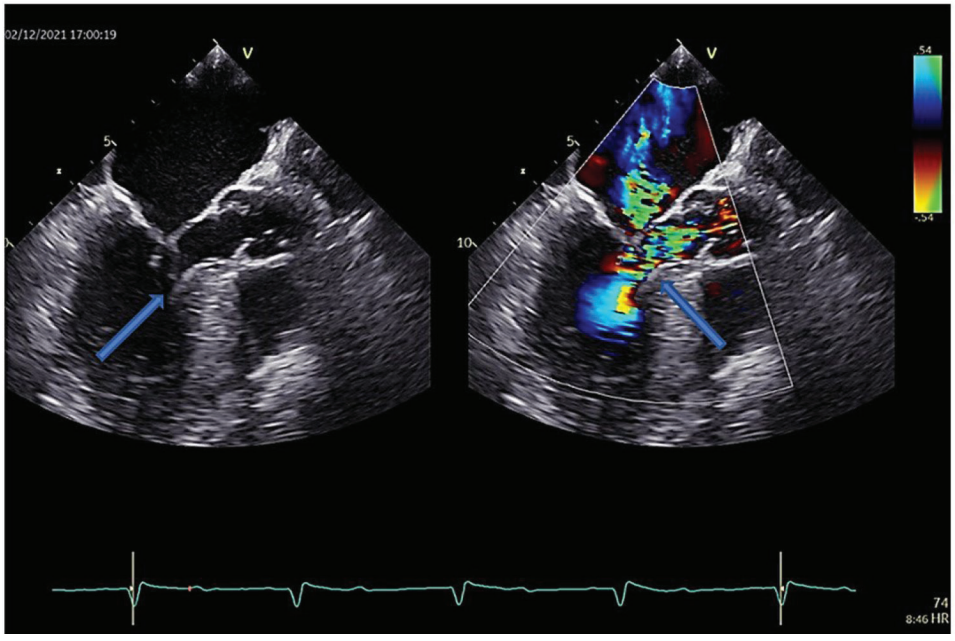

Figure 1 – *Intra-procedure TEE with and without color (at 150°): evaluation of the mitral valve, identification of the SAM and its localization. From this angle, we were able to more easily identify the location of greater acceleration of the flow and the degree of mitral valve regurgitation.*

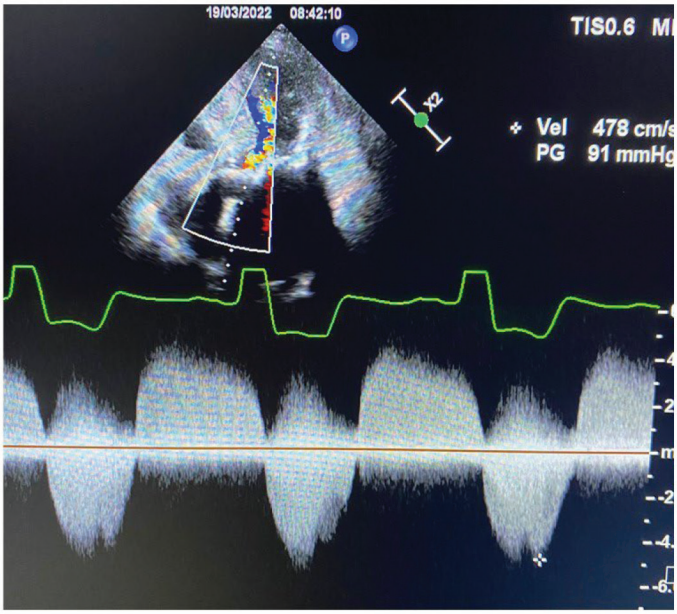

Figure 2 – *Continuous Doppler image with the shapes related to aortic stenosis and subvalvar obstruction*

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