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EDITORIAL

Transseptal catheterization for ablation in the left heart: what to do when the door is locked up tight?

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This editorial refers to 'Feasibility, safety, and outcome of a challenging transseptal puncture facilitated by radiofrequency energy delivery: a prospective single-centre study' by L. Capulzini *et al.*, on page 662.

In January 1992, I was in my second year out of training and one day I was involved in the ablation procedure in a patient with a manifest left-sided accessory pathway. After having positioned the catheter and performed the baseline electrophysiological study, it was time to move on to ablation, definitely not routine practice at that time. Accidentally, the steerable catheter entered the left atrium through a patent *foramen ovale* and to everybody's surprise it was easy to deflect the catheter, reach the target site with a suitable signal and interrupt accessory pathway conduction with the first radiofrequency energy application. This came after months of struggling beneath the mitral valve to reach the site suitable for ablation of left-sided accessory pathways using a transaortic approach. It also demonstrated how access to the left atrium through the atrial septum was immensely useful in some cases. That unexpectedly quick and successful procedure, together with other considerations, stimulated our group to become familiar with the transseptal catheterization (TSP-C), since we could not count on a patent *foramen ovale* which is present in ~15–20% patients, usually when not needed. At that time, only a few interventional cardiologists were adequately trained in TSP-C, there was no compulsive need to access the left atrium for ablation purpose with the exception of some cases of left atrial tachycardia, and there was an aura of diffidence around this procedure, known as a possible source of life-threatening intra-procedure complications.

Since then, many things have changed and, in recent years, TSP-C has become part of the technical armamentarium of the interventional electrophysiologist. During the pulmonary vein ablation procedure, it represents the first and necessary step. Therefore, its quick and safe, and successful accomplishment is a prerequisite to expedite a complex procedure, increasingly used over the last years.[1] In fact, according to the TACIS survey,[2] the increased number of TSP-C procedures is linked to an increase in atrial fibrillation ablations. Another interesting finding of this survey is that the widespread use of this technique has not resulted in a catastrophic increase in complications related to TSP-C. However, although the rate of major and minor complications of this procedure is well below 1%, mortality rate is not zero.[2]

Nowadays, TSP-C is widely used in electrophysiology, although with different materials, techniques, and tools. It provides highly feasible and safe access to approach left-sided arrhythmogenic substrates and we can affirm that the aura of diffidence around this technique is progressively dissolving. However, the biggest mistake at this point would be to underestimate the possible difficulties and risks related to this demanding procedure. TSP-C requires specific training.[3] Nobody should start performing this procedure without an adequate period of training and supervised performance by an experienced colleague. Watching videos, reading books or articles, or even visiting a high-volume centre for a couple of days is not enough. In a two-centre study, we are currently evaluating the impact of simulator training for this procedure and we hope that virtual reality will help to improve and shorten the early phase of the learning curve, by allowing better assimilation of the complex procedure workflow. TSP-C also requires accuracy to correctly complete all the steps to accomplish the procedure. During localization of the *fossa ovalis*, atrial septal puncture, and advancement of the transseptal assembly in the left atrium details count even after hundreds of procedures successfully performed. Finally, clinical experience is also essential to understand when and where to expect difficulties and to know how to deal with them.

In this issue of the Journal, the paper by Capulzini *et al.*[4] deal with difficult cases of TSP-C during an electrophysiological procedure. Their definition of difficult cases is based on failure to

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access the left atrium after two transseptal puncture attempts, which is usually when the first operator starts sweating and the laboratory becomes silent. They found this condition in 18 of 162 (11%) consecutive patients undergoing left atrial arrhythmia ablation. In this subset of patients, with an atrial septum resistant to puncture, a single application of electrocautery to the needle hub, under transoesophageal echocardiography guidance to assess the correct position on the needle in the *fossa ovalis*, allowed atrial septal perforation and safe procedure accomplishment. This modification of TSP-C has been already described,[5–7] and this study further demonstrates that this manoeuvre is safe, effective, and simple in a relatively large series of consecutive cases and that the transoesophageal mode to visualize the atrial septum and the adjacent structures can be used instead of the intracardiac probe, sparing extra-costs. In this paper, as well as in the previous reports, it is emphasized that ultrasound imaging is mandatory when electrocautery is used. In fact, electrocution of inappropriate structures could result in perforation with the loss of elastic tissue recoil and this may lead to a devastating intrapericardial bleeding. Finally, although no transoesophageal echocardiogram was performed to exclude the presence of a clinically significant iatrogenic atrial septal defect, no sequaele were observed during follow-up.[4]

As reported earlier by the same authors[8] and by two other groups including ours,[9,10] another method to safely puncture a resistant atrial septum employs a special transseptal 0.014 in. guidewire with a sharp, J-shaped nitinol tip. When a resistant atrial septum is encountered, while the needle tip is tenting the *fossa ovalis*, this guidewire can be straightened, inserted, and advanced into the needle lumen. When its sharp tip protrudes from the needle lumen, it perforates the atrial septum and, soon after, it resumes its J-shape, becoming atraumatic, so that it can be safely advanced into the left superior pulmonary vein. Afterwards, the transseptal assembly can be advanced over the wire to safely accomplish TSP-C. Pooling together the data of the two series of consecutive patients,[9,10] this technique was successfully used in 36 patients with a resistant atrial septum out of a total of 283 cases undergoing TSP-C, without ultrasound guidance. In 34, using the transseptal guidewire left atrial access could be obtained at the first attempt, while in the remaining two multiple attempts were required. This clearly demonstrates that this method also facilitates the transseptal puncture in case of a resistant atrial septum.

More good news can be gathered if we pool together data of the four recently published papers[4,7,9,10] reporting on these two methods (application of radiofrequency energy to a standard Brockenbrough needle or use of the transseptal guidewire) in a series of consecutive patients with a resistant atrial septum. Out of 714 TSP-Cs, only one complication related to this procedure has been reported: a puncture of the posterior left atrium with mild pericardial effusion, not requiring pericardiocentesis. This accounts for a complication rate of 0.14%, which is 5.6-fold less than that reported in the TACIS survey which was already considered acceptable. This stresses the concept that, in order to keep the complication rate related to TSP-C low, one of these two methods should be considered when a resistant atrial septum is encountered.

The final issues to discuss are: how often should we expect an atrial septum resistant to puncture and, more importantly, can we predict its presence? The answer to the first question is that the prevalence of such a condition depends very much on the criterion used to define a resistant atrial septum. When a median of six failed attempts of puncture is considered, its prevalence is 5%;[7] it increases to 11% when two failed attempts are considered[4] and becomes 23% when a resistant atrial septum is defined as inability be perforated it by applying moderate pressure at the first attempt.[10] Although all these definitions are questionable, it is conceivable that in a complex procedure such as atrial fibrillation ablation these two methods to facilitate transseptal puncture, once the *fossa ovalis* is correctly identified, should be considered early, in order to expedite a long procedure and to avoid possible complications related to multiple attempts at puncture. The answer to the second question is even more difficult. Indeed, there is a significant body of evidence indicating that multiple previous TSP-Cs are associated with difficulties during the subsequent septal puncture, due to the development of septal fibrosis. However, in the general population, neither the left atrium/atrial septum characteristics on the preprocedural transoesophageal echocardiogram[7] nor the clinical characteristics[10] can predict the presence of this condition which can be found even in younger patients without structural heart disease during the first TSP-C.

Therefore, although we are waiting for multicentre large series, these reports should stimulate operators to become familiar with one of these two methods and apply it early, when a resistant atrial septum is encountered.

Conflict of interest: R.D.P. is a consultant for Biosense-Webster and CathRx and has received lecture fees from Boston Scientific.

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