

Atrial flutter ablation by femoral approach in a woman with azygos continuation of an interrupted inferior vena cava and dual chamber pacemaker

Ablation d'un flutter atrial par approche fémorale chez une femme avec interruption de la veine cave inférieure et pacemaker double chambre

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RÉSUMÉ

Cette observation décrit une ablation par radiofréquence d'un flutter atrial isthmique dépendant chez une femme de 54 ans présentant une anomalie du retour veineux systémique avec absence de veine cave inférieure (VCI) et porteuse d'un stimulateur cardiaque double chambre. Malgré la mise en boucle des cathéters, l'ablation du flutter a été réalisée avec succès sans altération des sondes du stimulateur cardiaque.

C'est la première observation d'une approche inféro-supérieure d'une ablation d'un flutter atriale en l'absence d'une VCI périhépatique avec présence de sondes chroniques à demeure dans la zone ciblée pour la radiofréquence.

Mots-clés

Interruption de la veine cave inférieure; veine azygos; flutter atriale; ablation par cathéter

SUMMARY

This report describes a case of isthmus-dependent atrial flutter ablation by the femoral approach in a 54-year-old woman with a previously unknown absence of the inferior vena cava (IVC) and dual chamber pacemaker. Despite looping of the catheters, ablation and termination of atrial flutter were performed successfully without function alteration of the pacemaker leads. This is the first report of an inferior-to-superior approach for ablation of atrial flutter in the absence of the perihepatic IVC with the presence of chronic indwelling leads in the area targeted for radiofrequency.

Key-words

Interrupted inferior vena cava, azygos vein, atrial flutter, catheter ablation

Radiofrequency catheter ablation of the cavotricuspid isthmus (CTI) has become the therapy of choice for isthmus-dependent atrial flutter [1]. The inferior approach via the femoral vein is the common approach, associated with a good stability of the ablation catheter. Congenital anomalies of the venous system as an interruption of the inferior vena cava (IVC) may limit catheter ablation. This report presents an inferior-to-superior approach for ablation of atrial flutter in the absence of the perihepatic IVC with the presence of chronic indwelling leads in the area targeted for radiofrequency.

PATIENT AND OBSERVATION

A 54 year old woman who had a permanent dual chamber pacemaker three years earlier for a symptomatic sinus node dysfunction was referred for radiofrequency catheter ablation (RFCA) of a typical atrial flutter (AFL). After elimination of left atrium thrombus by a transesophageal echocardiography, access to right atrium (RA) was attempted through the right femoral vein, however the catheters followed an abnormal course. A 10-pole catheter (IBI, Saint Jude, USA) was placed in the RA around the tricuspid annulus, and a 8 mm tip ablation catheter (IBI, Saint Jude, USA) in the RA. The diagnosis of an interrupted inferior vena cava and azygos continuation was postulated. Despite the abnormal course of catheters, we decided to continue the procedure. It was possible to locate the 10-pole catheter with the proximal 4 poles in the cavotricuspid isthmus (CTI) parallel to the tricuspid annulus and with distal 6 poles within the coronary sinus (CS) to record the left atrial activity and to obtain the stability of the catheter. The atrial activation sequences at the CTI were from septal to lateral, and entrainment pacing at the CTI revealed that the post pacing interval equal to the cycle length of the AFL. Based on these findings, the AFL was diagnosed as clockwise CTI- dependent AFL (Figure n°1). A 8 mm tip ablation catheter was then positioned at the CTI throughout the azygos via the same femoral approach as the decapolar catheter. The radiofrequency (RF) ablation was performed without the guidance of a non-fluoroscopic navigation system. The presence of the right ventricle lead near the area targeted for RF ablation made difficult the manipulation of the catheters and the delivery of RF applications. Ablation was commenced on the tricuspid edge of the CTI and radiofrequency (RF) energy was delivered point by point until the IVC was reached (Figure n°2; Panel A and Panel B). During RF current applications on the IVC edge of the cavotricuspid isthmus (CTI), the patient's tachycardia was successfully terminated. Additional RF applications were delivered until bidirectional block was confirmed by marked prolongation of transisthmus conduction time evaluated during stimulation from the low lateral and CS ostium (Figure n°3).

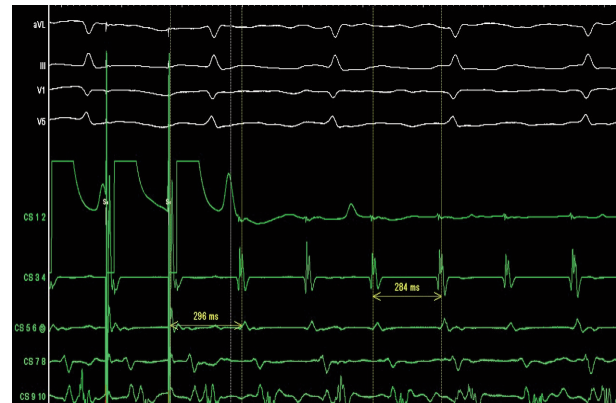


Figure 1 : Intracardiac electrograms showing a clockwise CTI-dependent atrial flutter confirmed by atrial entrainment. CS 1-2 to 9-10 = first to fifth electrode pairs of the CS catheter.

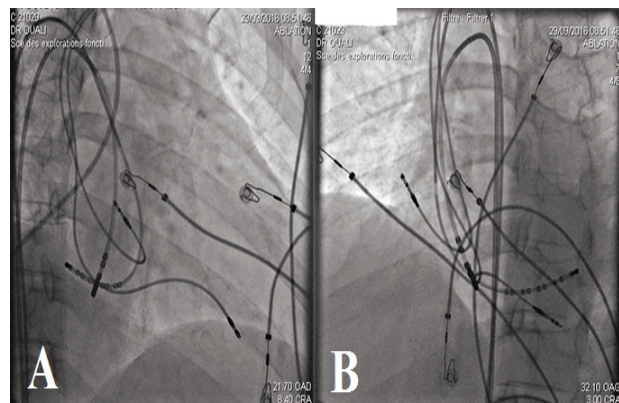


Figure 2: Position of the catheters in the right anterior oblique (Panel A) and the left anterior oblique (Panel B) fluoroscopic views. The coronary sinus and the ablation catheters are placed via the azygos vein.

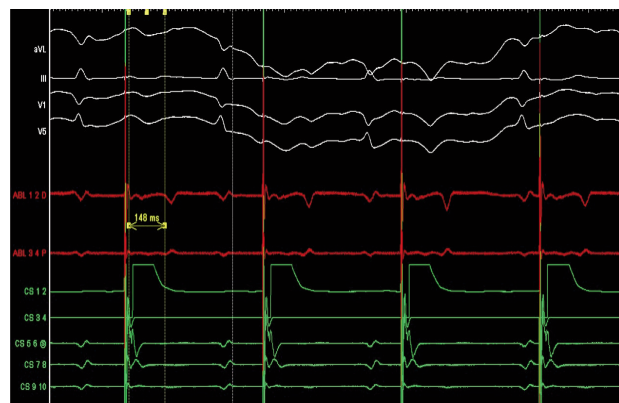


Figure 3: Ablation-induced bidirectional block with a delay time of 148 ms between the double potential recorded by the ablation catheter in the cavotricuspid isthmus.

The procedure took 2h and 30 mn of RF application. Lead impedance and P wave pacing threshold of pacemaker

were measured before and after ablation. No changes were observed. There were no complications and the patient had no recurrence arrhythmias at 15 months follow-up. A computed tomography (CT) of the abdominal venous system was performed. The CT revealed the absence of the upper parts of the IVC proximal to the entrance of the renal veins.

DISCUSSION

The frequency of congenital anomalies of the inferior vena cava is not well known in patients undergoing catheter ablation, where it is usually an accidental finding. Several cases of atrial flutter ablation in patients with abdominal venous anomalies have been reported [2-8]. Some of which were attempted by the superior approach via the subclavian or jugular veins [3;5;8]. Reasons to choose the superior approach are often the impossibility to have an inferior access or the expected technical difficulties using anomalous inferior paths. In our case and in other cases [2;4;7], even with the uncommon approach, a stable catheter position and successful ablation could be achieved. Only in one case the procedure using femoral approach was abandoned [6]. Like Guenther et al

[7], the procedure was pursued via the inferior approach in order to avoid a supplementary puncture, despite the anomalous anatomy that was fortuitously identified at the beginning of the electrophysiological study. To the best of our knowledge, this is the first report on RF catheter ablation of atrial flutter by the inferior approach in a patient with interruption of the IVC (inferior- to superior approach) and the presence of chronic indwelling leads in the area targeted for RF catheter ablation, that may pose a technical challenge and reduce the likelihood of success of the ablation. In addition, application of lesions in close proximity to pacemaker leads could affect their function. Seven cases of atrial flutter radiofrequency ablation with interrupted inferior vena cava have been described in the literature with and without non-fluoroscopic navigation system (Table 1).

CONCLUSION

Based on these cases, RF ablation of atrial flutter by the femoral approach in the absence of inferior vena cava, is effective, safe and should be tried and pursued in this challenging anatomical situation, even in patients with multiple chronic atrial and ventricular indwelling catheters.

Table 1: Clinical and technical characteristics of patients with atrial flutter ablation with interrupted inferior vena cava described in the literature

Authors	Age/sex	Congenital heart disease	non-fluoroscopic navigation system	Venous approach of the ablation catheter	Ablation catheter	Duration or number of RF application
Yamada T et al [2]	46/M	Heterotaxy syndrome PLSVC VSD	Conventional	Femoral approach, azygos vein, PLSVC	8 mm catheter	NA
Pons F et al [3]	35/M	Heterotaxy syndrome NCLV, Sick sinus syndrome, Mobitz II AVB	Ensite Navx	left subclavian vein	8-mm ablation catheter	NA
Perez-Silva A et al [4]	62/M	None	Ensite Navx	Femoral approach	Irrigated 4 mm tip ablation catheter	37 mn
Forleo GB et al [5]	58/F	Situs inversus	Carto Merge and ICE	left jugular vein	Irrigated 4 mm tip ablation catheter	310 s
Mamidipally S et al [6]	70/M	Sick sinus syndrome	Conventional	Femoral approach	Procedure was abandoned	Procedure was abandoned
Guenther J et al [7]	77/M	None	conventional	Femoral approach	8-mm ablation catheter	24 RF lesions
Malavasi VL et al [8]	56/M	Sick sinus syndrome	conventional	left subclavian vein	8-mm ablation catheter	660 s
Our case	54/F	Sick sinus syndrome, Pacemaker	conventional	Femoral approach	8-mm-ablation catheter	30 mn

AVB : atrioventricular block, ICE : intracardiac echocardiography, NA : not available, LV : NCLV : Non compaction left ventricle, PLSVC : persistent left superior vena cava, VSD : ventricular septal defect

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