

[CASE REPORT]

Migraine-like Headache after Transseptal Puncture for Catheter Ablation: A Case Report and Review of the Literature

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Abstract:

Catheter ablation for atrial fibrillation creates an iatrogenic atrial septal defect by transseptal puncture, which may produce a transient right-to-left shunt. We encountered a 44-year-old man who presented with *de novo* migraine-like headache after cryoballoon ablation for atrial fibrillation. On reviewing the literature, we found additional cases in which migraine-like headache occurred within one week after the procedure and spontaneously within three months. We should recognize migraine-like headache as a potential complication of catheter ablation.

Key words: migraine, transseptal puncture, iatrogenic atrial septal defect, right-to-left shunt

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Introduction

Catheter ablation for atrial fibrillation (AF) requires access to the left atrium via transseptal puncture (TsP), regardless of the ablation energy source used (cryotherapy or radiofrequency energy) (1, 2). TsP is performed even in patients with a pre-existing patent foramen ovale because it provides favorable access to the posterior structures (e.g., pulmonary veins) targeted during this procedure (2). Because TsP causes an iatrogenic atrial septal defect (IASD), it can cause a transient right-to-left shunt (RLS) (3, 4).

RLSs, including those caused by ASD and patent foramen ovale, are associated with an increased prevalence of migraine (5, 6). The episodes of migraine-like headache in patients undergoing catheter ablation are rarely recognized by both cardiologists and neurologists. We herein report a case of *de novo* migraine-like headache after TsP for catheter ablation and review the clinical features.

Case Report

A 44-year-old man with a history of medication-resistant

AF was referred for cryoballoon ablation of AF. The patient had no history of migraine. Under conscious sedation, a single TsP was performed through the fossa ovalis into the left atrium using an NRG radiofrequency transseptal needle (Baylis Medical, Ontario, Canada) and a 15-French (outer diameter) sheath (FlexCath Advance Steerable Sheath; Medtronic, Minneapolis, USA). The puncture was guided by intracardiac echocardiography. Intravenous heparin was administered, and an activated clotting time of 300 to 400 seconds was maintained throughout the procedure. The patient underwent successful isolation of all pulmonary veins using a 28-mm cryoballoon ablation catheter (Arctic Front Advance; Medtronic) (Figure). The day after the procedure, the patient was restarted on oral anticoagulation with rivaroxaban.

Two days after the ablation procedure, the patient suddenly developed visual disturbance characterized by bilateral slowly enlarging scotomas with a scintillating edge and numbness of the right hand. The visual disturbance lasted for about 20 minutes and then resolved completely, but the numbness remained. The patient had no other associated symptoms; in particular, he had no headache. Brain magnetic resonance imaging and angiography findings were unremarkable. The numbness of the right hand improved, and

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the patient was discharged 4 days after the ablation procedure.

The day after his discharge, the patient developed a scintillating scotoma that gradually expanded over a 5- to 20-minute period, followed by a pulsating headache in the bilateral forehead accompanied by photophobia and nausea, which improved spontaneously after 3 hours. The patient subsequently experienced similar daily headache attacks.

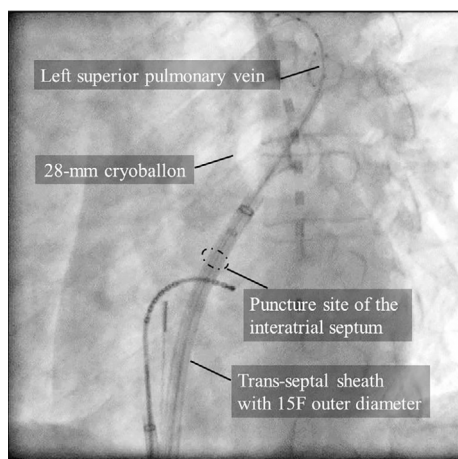


Figure. A 28-mm cryoballoon catheter was positioned in the left superior pulmonary vein via transseptal puncture. The image was taken in the left anterior oblique 40° projection.

The intensity of the headache was mild to moderate and did not require analgesics. The duration of the headache was 3 to 6 hours. The headaches were worsened by routine physical activity. Although the headaches had characteristics of migraine with aura [International Classification of Headache Disorders 3rd Ed. (ICHD-3), code 1.2.1] (7), they disappeared after 1 week and subsided with no further recurrence over an 18-month follow-up period. We were unable to perform echocardiography during the headache attacks. Transthoracic echocardiography performed 18 months after the ablation revealed no cardiac shunt.

Discussion

An iASD is present in nearly all patients immediately after TsP (8). Most iASDs spontaneously close by 12 months, although up to 26% can persist beyond this time (3, 4, 8). Cryoballoon ablation is performed using a large transseptal sheath (15 French, vs. 8 French for radiofrequency AF ablation), which may be associated with an increased risk of postprocedural iASD with RLS (4). Although we did not detect an iASD after the present procedure, transient RLS should have occurred in our case using a cryoballoon. iASDs narrow or close in most patients over time (3, 4, 8), which may contribute to spontaneous resolution of migraine, as in our case.

Various mechanisms have been postulated for the associa-

Table. Clinical Characteristics of *de novo* Migraine-like Headache or Exacerbation of Prior Migraine.

Reference	Type of study	Number of patients	Age (y)	Sex	Type of arrhythmia	History of migraine	Type of procedure	Number of days post-procedure	Type of migraine	Duration of migraine after onset	Follow-up period
(13)	Case report	1	46	F	PSVT, WPW	MO	R	1	MA	ND	ND
(14)	Case report	1	25	F	Ectopic atrial tachycardia	-	R	4	MA	6 w	6 m
		1	47	M	AF	-	R	ND	MA	6-8 w	6-8 w
		1	44	M	AF	MO	R	0	MO	3 m	3 m
		1	55	F	PSVT, WPW	MA	R	0	iVA	ND	ND
(9)	Case report	1	39	F	PSVT	MO	R	1	iVA	ND	13 m
		1	38	M	AF	-	R	7	iVA	ND	12 m
		1	43	F	AF	-	R	4	iVA	ND	5 m
(12)	Retrospective	5 ^a	46±11	M4, F1	AF	-	C	ND	ND	<3 m	3 m
		3 ^b	ND	ND	AF	-	C	ND	ND	<3 m	3 m
(10)	Retrospective	22	55±9	ND	AF	-	ND	<90	MA>MO	ND	1-2 y
(11)	Prospective	2	ND	ND	AF	-	R	<7	MA	ND	17±5 m
		2	ND	ND	AF	+	R	ND	ND	ND	17±5 m
(15)	Case report	1	58	F	AF	-	C	1	MA	1 w	1 m
(16)	Case report	1	60	F	AF	MO	C	1	MA	ND	ND
Present case	Case report	1	44	M	AF	-	C	2	MA	1 w	18 m

^aFirst intervention group

^bRe-intervention group

F: female, M: male, R: radiofrequency ablation, C: cryoballoon ablation, AF: atrial fibrillation, PSVT: paroxysmal supraventricular tachycardia, WPW: Wolff-Parkinson-White, MA: migraine with aura, MO: migraine without aura, iVA: isolated visual aura, ND: not described, w: week, m: month

tion between an RLS and migraine, including exposure of the cerebral circulation to certain venous factors because of loss of pulmonary clearance, cerebral microembolism, and effects on the endothelial and platelet function in patients susceptible to these factors (5, 6).

De novo migraine-like headache generally seems to be an uncommon complication of AF ablation involving TsP. The estimated incidence of *de novo* migraine-like headache after the procedure is very low (0.5-2.3%) (9-11). Jordaens et al. reported its occurrence as 8% (12), but this extraordinarily high rate may have been because of an inappropriate migraine questionnaire. The clinical characteristics of *de novo* migraine-like headache or the exacerbation of prior migraine are shown in Table (9-16). With respect to the migraine subtype after the procedure, migraine with aura or isolated visual aura were more common than migraine without aura. The migraine subtype changed in four patients (9, 13, 14). Mild headache or migraine aura without headache may be features of migraine after ablation (9, 14), as in our case. In most cases, these attacks occurred within one week after the procedure and spontaneously disappeared within three months (9-16), which is in accordance with our case. However, a few patients complained of persistent migraine (10, 13). Although an iASD seems to be regarded as the most likely mechanism in most reports, the presence of an ASD or residual shunting was rarely demonstrated (10).

Another study showed that a patient with *de novo* migraine-like headache and aggravation of pre-existing migraine had a subtherapeutic warfarin level during the procedure and new cerebral infarcts (11). The incidence of asymptomatic cerebral infarctions during catheter ablation of atrial fibrillation is reported to be 5-42% (17). In a mouse model, microemboli triggered cortical spreading depression without causing infarction (18). If translatable to our case, microemboli and/or particulate material from equipment may trigger cortical spreading without infarction and cause migraine-like headache with aura, regardless of cardiac shunting.

Although headache after catheter ablation is generally described as a primary headache in previous reports (9-16), it is actually considered to be a secondary one. The most appropriate diagnosis in accordance with ICHD-3 may be headache attributed to other disorders of homeostasis (code 10.7) (7).

We encountered a case of *de novo* migraine-like headache after TsP for catheter ablation and reviewed the clinical features. We should recognize migraine as a potential complication of catheter ablation. Furthermore, migraine-like headache after catheter ablation may suggest a potential mechanism of migraine.

The authors state that they have no Conflict of Interest (COI).

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