Radiofrequency Catheter Ablation for Various Tachyarrhythmias : Experience in the Bangkok Heart Institute

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Abstract

Radiofrequency catheter ablation (RFCA) is the first-line therapy for various tachyarrhythmias. The authors reports experience of RFCA for various types of tachyarrhythmia in 80 consecutive patients, 85 tracts of ablation, from May 2001 to October 2002. The mean age was 40 years, range 6-81 years. Seventy four and 13 tracts of ablation were supraventricular and ventricular arrhythmia, respectively. The results are shown below.

	AVNRT	AVRT	WPW	AFl	PAF	AT	PVC	VT	SNRT
Total patients	21	13	8	5	10	9	11	2	1
Total pathway	23	13	8	6	10	10	11	2	2
Initial success (%)	100	100	100	100	100	90	100	100	100
Complication (%)	1 (5)	0	0	0	1(10)	0	0	0	0
Recurrence	0	1 (8)	0	1 (20)	1(10)	0	1(9)	1(50)	0
Final success (%)	100	100	100	100	90	90	90	100	100

Overall success, complication, and recurrent rates were 94, 2.5 and 5.7%, respectively

AVNRT = atrioventricular nodal reentrant tachycardia, AVRT = atrioventricular reciprocating tachycardia, WPW = Wolff-Parkinson-White, AFl = atrial flutter, PAF = paroxysmal atrial fibrillation, AT = atrial tachycardia, PVC = premature ventricular contraction, VT = ventricular tachycardia, SNRT = sinus node reentry tachycardia.

Conclusion : RFCA is an effective method to cure various types tachyarrhythmia. Long-term follow-up should be evaluated in patients with paroxysmal atrial fibrillation.

Key word : Tachyarrhythmia, Radiofrequency, Ablation

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Radiofrequency catheter ablation (RFCA) is the effective method to cure various type of tachyarrhythmia, both supraventricular and ventricular tachyarrhythmia, such as atrioventricular nodal reentrant tachycardia (AVNRT), bypass tract, atrial flutter (AFl), atiral tachycardia (AT) and ventricular tachycardia (VT)[1-8]. We started RFCA in our institute since 2001. The aim of this study was to report the results of RFCA from our experience in 80 patients with various type of tachyarrhythmia, including paroxysmal atrial fibrillation.

PATIENTS AND METHOD

From May 2001 to October 2002, 80 consecutive patients underwent RFCA in our institute. The mean age was 40 years, range 6-81 years. The ratio between male and female was 1 : 1.1. The most common symptom during tachycardia was palpitation (98%). The other symptoms were presyncope (10%), syncope (3%) and dyspnea on exertion (1%).

Electrophysiological study, mapping and ablation

After obtaining informed written consent from all patients, an invasive electrophysiological study was performed in the fasting state and after discontinuation of all antiarrhythmic agents for more than three half-lives, except amiodarone which was discontinued for two months. However, amiodarone in patients who had paroxysmal atrial fibrillation (PAF) whose rhythm could not be controlled or needed amiodarone to control their symptom but still had PAF might not be discontinued for two months and accepted for ablation.

The method for mapping and ablation of AVNRT, bypass tract, AT and AFl has been described previously from the authors[9] and from elsewhere[1-5]. Briefly, for accessory pathway, the shortest atrioventricular and ventriculoatrial conduction times, during antegrade and retrograde conduction, respectively, were used as the target site for ablation. For atrial tachycardia, the authors tried to identify the earliest site of atrial activation before the surfaced P wave which was presumed to be the origin of ectopic AT. For atrial flutter and AVNRT, an anatomical approach for ablation at the isthmus between the tricuspid annulus (TA) and inferior vena cava (IVC) and slow pathway, respectively were used. For paroxysmal atrial fibrillation[10] the authors used a lasso catheter for mapping and used the technique for segmental isolation of all pulmonary veins for ablation and created an isthmus line of block from TA to IVC in all cases.

For ventricular arrhythmia[6], both the earliest endocardial activation time before surfaced QRS complex of premature ventriculary contraction (PVC) or VT and pace mapping were used to identify the site for ablation. Heparin was given in patients who needed left sided mapping and ablation. The initial bolus dosage was 2,500 units followed by 1,000 units hourly until completion of the procedure. Activated doting time (ACT) was measured every 20 minutes in PAF ablation and heparin was increased to maintain ACT > 250 sec.

Follow-up

After the ablation procedure, all the patients were monitored continuously in the hospital for 24-48 hours before discharge without an antiarrhythmic agent, except patients with paroxysmal AF. Cordarone 600 mg/day was prescribed to PAF patients for the next 2-3 months and discontinued after that. All patients were evaluated by one of the first two investigators on a regular basis, every two to four weeks in the first few months and every 2-3 months after that, in order to detect the recurrence.

RESULTS

There were 85 ablative pathways from 80 patients as shown in Table 1 and 2. Sixty two pathways (73%) were supraventricular tachyarrhythmia (SVT). The remainder (27%) was ventricular arrhythmic. The most common SVT was AVNRT (26%). The second and third common SVT were bypass tract, atrioventricular reciprocating tachycardia (AVRT) + Wolff-Parkinson-White (WPW), 24 per cent and atrial tachycardia and paroxysmal atrial fibrillation, 11 per cent in each, respectively. The most common ventricular arrhythmia was PVC from right ventricular outflow tract (RVOT) (64%), 2 each from left ventricular outflow tract (LVOT) and right ventricular inflow (RVIF).

The initial success, failure, recurrence and final success rates are also shown in Table 1 and 2. The lowest success rate was atrial tachycardia from the left atrium. The longest fluoroscopic and procedure times were left atrial and left PVC ablation, respectively. The shortest fluoroscopic and procedure times in SVT ablation was WPW ablation. Most of

Table 1. Results of radiofrequency catheter ablation for supraventricular tachycardia.

	AVNRT	%	AVRT	%	WPW	%	L.AT	%	R.AT	%	AFl	%	P.AF	%	SNRT	%
Total cases	21		13		8		4		5		5		10		1	
Total pathways	23		13		8		4		6		6		10		2	
Fail ablation	-		-		-		1	-	-	-	-					
Initial success	23	100	13	100	8	100	3	75	6	100	6	100	10	100	2	100
Complication	1		-		-		-		-		-		1		-	
Fluoroscopic time (min)	19		80		14		107		20		25		93		21	
Procedure time (min)	100		210		80		305		165		102		317		105	
Recurrence	-		1*	80	-		-		-		1	20	1	10	-	
Reablation	-		1		-		-		-		1		1		-	
Final success (%)	100		100		100		75		100		100		90		100	

AVNRT = atrioventricular nodal reentrant tachycardia, AVRT = atrioventricular reciprocating tachycardia, WPW = Wolff-Parkinson-White
L = left, R = right, AT = atrial tachycardia, AFl = atrial flutter, PAF = paroxysmal atrial fibrillation, SNRT = sinus node reentry tachycardia.

them (87%) had a right sided bypass tract but for AVRT all of them had a left sided bypass tract Recurrence occurred in AVRT, AFl, AF and PVC in one each. All of them, except 1 PVC, underwent successfully reablation. The patient who had recurrent PVC denied reablation.

The overall complication rate was 2.5 per cent in the authors experience. Complete atrioventricular block and needed permanent pacemaker implantation occurred during one slow pathway ablation and deep vein thrombosis (DVT) occurred in 1 AF ablation. Deep vein thrombosis was resolved after heparin infusion and switch to warfarin ingestion.

DISCUSSION

Main findings

The results of this study showed that RFCA is a highly effective and safe procedure to cure various types of tachyarrhythmia. The overall final success and recurrent rates were 94 per cent and 5.7 per cent, respectively. Reablation could also be performed with a high success rate. RFCA has become the first choice for accessory pathway, AVNRT, AFl and idiopathic VT. After improving the technique for mapping and ablation, many types of the difficult tachyarrhythmia such as left atrial tachycardia, paroxysmal AF, left PVC from LVOT and right PVC for RVIF could also be cured by RFCA with a high success and low complication rates. However, left sided ablation needed longer fluoroscopic and procedure times.

Complication of RFCA

The overall major complication rate in this study was 2.5 per cent. Complete AV block occurred in 1 AVNRT during slow pathway ablation. Deep vein thrombosis occurred in 1 PAF ablation who had 4 venous sheath two 6F and two 8F, in the right femoral vein. She developed DVT 2 days after ablation. However, this condition was resolved after treatment with heparin and warfarin. After this case, the authors used both femoral veins for PAF ablation and there was no vessel complication.

Comparison with previous studies

The present had similar efficacy as previous reports[9], but the authors ablated more difficult arrhythmia e.g. left AT, RVIF PVC, LVOT PVC and paroxysmal AF with fewer complications. This might be due to the study having fewer patients who had

Table 2. Results of radiofrequency catheter ablation for ventricular arrhythmia.

	L.VT	%	R.VT	%	L.PVC	%	R.PVC	%
Total cases	1		1		2		9	
Total pathways	1		1		2		9	
Fail ablation	-		-		-		-	
Initial success	1	100	1	100	2	200	9	100
Complication	-		-		-		-	
Fluoroscopic time (min)	74		8.3		86		21	
Procedure time (min)	225		135		360		180	
Recurrence	1	100	-		-		1	11
Reablation	1	-	-	-				
Final success (%)	100		100		100		89	

L = left, R = right, VT = ventricular tachycardia, PVC = premature ventricular contraction.

underlying disease, the operator had more experience and improvement of the mapping catheter and system. The authors used lower energy power, not more than 30 watts, for PAF to prevent perforation and pulmonary vein stenosis. A long sheath was also used for ablation of right sided bypass tract, in order to reduce the fluoroscopic and procedure times.

SUMMARY

The presented data demonstrated that RFCA is a highly successful method for the treatment of various types of cardiac arrhythmia, including left PVC and PAF. However long-term evaluation especially in patients who have paroxysmal AF should be carried out.

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การจี้หัวใจเต้นเร็วผิดจังหวะชนิดต่าง ๆ ด้วยคลื่นไฟฟ้าความถี่เท่าคลื่นวิทยุ : ประสบการณ์ที่ศูนย์หัวใจกรุงเทพ

องค์การ เรืองรัตนอัมพร, พบ, เกียรติชัย ภูริปัญโญ, พบ*, ชาญ ศรีรัตนสถาวร, พบ**, ชุณหเกษม โชตินัยวัตรกุล, พบ***

ผู้รายงานได้รายงานผลการรักษาภาวะหัวใจเต้นเร็วผิดจังหวะด้วยคลื่นไฟฟ้าความถี่เท่าคลื่นวิทยุที่ศูนย์หัวใจกรุงเทพ ในผู้ป่วย 80 ราย อายุเฉลี่ย 40 ปี ตั้งแต่เดือนพฤษภาคม 2544 ถึง เดือน ตุลาคม 2545 ได้ผลดังแสดงในตาราง

	AVNRT	AVRT	WPW	AFI	PAF	AT	PVC	VT	SNRT
ผู้ป่วยทั้งหมด	21	13	8	5	10	9	11	2	1
ประสาทที่จี้ทั้งหมด	23	13	8	6	10	10	11	2	2
ผลสำเร็จเริ่มแรก (%)	100	100	100	100	100	90	100	100	100
ภาวะแทรกซ้อน (%)	1 (5)	0	0	0	1 (10)	0	0	0	0
การกลับเป็นใหม่ (%)	0	1 (8)	0	1 (20)	1 (10)	0	1 (9)	1 (50)	0
การจี้ซ้ำ	–	1	–	1	–	1	–	1	–
ผลสำเร็จขั้นสุดท้าย (%)	100	100	100	100	90	90	90	100	100

ผลสำเร็จโดยรวม ภาวะแทรกซ้อน และการกลับเป็นซ้ำคือ 94%, 2.5 % และ 5.7% ตามลำดับ

ดังนั้น การรักษาหัวใจเต้นเร็วผิดจังหวะด้วยคลื่นไฟฟ้าความถี่เท่าคลื่นวิทยุเป็นวิธีที่ได้ผล มีประสิทธิภาพและปลอดภัย สำหรับผู้ป่วยหัวใจห้องบนเต้นพลิ้วเป็นพัก ๆ สมควรติดตามผลในระยะยาวต่อไป

คำสำคัญ : ภาวะหัวใจเต้นเร็วผิดจังหวะ, คลื่นไฟฟ้าความถี่เท่าคลื่นวิทยุ, การจี้หัวใจ

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