

Radiofrequency Ablation of Accessory Pathways: a 14 Year Experience at the Tel Aviv Medical Center in 508 Patients

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Abstract

Background: Radiofrequency ablation has been suggested as first-line therapy in the management of accessory pathways. There are limited data on the results of ablation over years of experience.

Objectives: To assess the results and complications following RFA of APs performed in our institution over a 14 year period.

Methods: RFA was performed using deflectable electrode catheters positioned at the mitral or tricuspid annulus. The site of the AP was localized by electrophysiological study and radiofrequency energy was applied via the tip of the catheter

Results: The study cohort comprised 508 consecutive patients (64.2% males, mean age 33.6 ± 15.1 years) who underwent 572 RFA procedures for ablating 534 APs. A single AP was found in 485 (95.5%) patients while multiple APs were noted in 23 patients (4.5%). The APs were manifest, concealed or intermittent in 46.8%, 44.4% and 8.8% of cases, respectively. AP distribution was as follows: left free wall (56.6%), posteroseptal (23%), right anteroseptal (7.9%), right free wall (6.2%), midseptal (3.4%) and right atriofascicular (3.0%). Acute successful rates for a first or multiple ablation attempts were 93.1% and 95.3%, respectively. At a first ablation attempt, acute success and failure rates were the highest for midseptal (100%) and right atriofascicular (12.5%) APs respectively. Right anteroseptal APs were associated with the highest rate (23.9%) of discontinued or non-attempted procedures. Recurrent conduction in an AP after an initial successful ablation was observed in 9.9% of cases; it was the highest (24.2%) for right free wall APs and the lowest (5.0%) for left free wall APs. During follow-up (85 ± 43 months), definite cure of the AP was achieved in 94.9% of cases following a single or multiple procedures: midseptal (100%), left free wall (98%), right free wall (97%), posteroseptal (92.7%), right atriofascicular (87.5%) and right anteroseptal (78.5%). A non-fatal complication occurred in 18 patients (3.5%), more frequently in females (6.6%) than in males (1.8%) ($P < 0.01$). The two major complications (pericardial effusion and myocardial ischemic events) mainly occurred during RFA of a left free wall AP using a retrograde aortic approach. Catheter-induced mechanical trauma to APs was observed in 56 cases (10.5%). Mechanical trauma mainly involved right atriofascicular (43.8%) and right anteroseptal (38.1%) APs and contributed to the low success rate of RFA at these AP locations. During the 14 year period, our learning curve was achieved quickly in terms of success rate, although the most significant complications were observed at the beginning of our experience.

Conclusions: The results of this study confirm the efficacy and safety of RFA and suggest that it is a reasonable first-line therapy for the management of APs at any location.

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Several groups have reported the results of their experience in radiofrequency ablation of accessory pathways [1-9]. Only a single study, however, analyzed the results of RFA over years of experience [10]. We report here our 14 year experience using RFA for APs.

Patients and Methods

The study group included 508 patients (64.2% males, age 9.5–77 years) who underwent RFA of APs in our laboratory between January 1992 and December 2005. The main clinical data are presented in Table 1. Most patients (94.7%) had no demonstrable heart disease. Only 13 (2.6%) were asymptomatic. Twenty-five (4.9%) of the study patients had additional inducible sustained atrioventricular nodal reentry tachycardia and underwent ablation of the slow pathway during the same ablation procedure.

Electrophysiological study

All electrophysiologic studies were performed after written informed consent was obtained from the patient or his/her parents. Only a few patients underwent the procedure under general anesthesia. Diagnostic catheters were inserted percutaneously into femoral veins and positioned in the His bundle area, the right ventricle, the high right atrium and, occasionally, the coronary sinus. The diagnostic electrophysiologic study included an evaluation of AP characteristics as well as the induction and determination of the mechanism of the induced tachycardia. The localization of APs was made according to standard criteria [11].

Radiofrequency ablation

After diagnostic electrophysiological study, an additional deflectable 7 French 4 mm tip electrode catheter for RFA was inserted. For left free wall APs, a retrograde aortic approach was primarily used during the first 12 years of our study unless a patent foramen ovale was present; during the last 2 years of the study we used a trans-septal approach. Posteroseptal APs were approached from the venous route first, and in the event of failure we used a retrograde

RFA = radiofrequency ablation

AP = accessory pathway

aortic approach. Right free wall, right anteroseptal and right atriofascicular APs were approached from a femoral vein or a right jugular vein. Midseptal APs were approached from either a femoral venous or retrograde approach. Non-temperature-controlled ablation catheters were used in our first 134 patients and temperature-controlled catheters in the remaining 374 patients. In patients undergoing ablation of left free wall APs a bolus of 5000 IU heparin was injected followed by a repeat injection of 1000 IU every subsequent hour.

Radiofrequency energy was delivered at sites where AP potentials were recorded, or at sites demonstrating the earliest antegrade ventricular activation during sinus rhythm and/or earliest retrograde atrial activation during orthodromic reentrant tachycardia or right ventricular pacing. The patients were followed at regular outpatient visits.

Definitions

Acute successful ablation of the AP was defined as abolition of conduction over the AP and non-recurrence of conduction during a follow-up period of 20–30 minutes. Results of the trans-septal approach included those achieved with both trans-septal puncture and via a patent foramen ovale.

Recurrence of conduction over the AP was considered present when ventricular pre-excitation or symptomatic AP-related tachycardia recurred after a successful ablation procedure. Catheter trauma to an AP was considered to exist when sudden complete block of conduction along the pathway occurred during catheter manipulation and was unrelated to radiofrequency pulses.

Data analysis

The study group was divided into four equal groups and the data were analyzed for each quartile. The periods during which the four quartiles of patients were studied were: 43.75 months (first quartile), 35.9 months (second quartile), 33.6 months (third quartile) and 53.2 months (fourth quartile).

Statistical analysis

All data were summarized and displayed as mean \pm SD for the continuous variables (age, number of RF pulses, etc.), and as the number of patients plus the percentage in each group for categorical variables (gender, AP location, etc.). The cross-tabs and descriptive procedures were used to produce frequencies of categorical variables and mean \pm SD of continuous variables. For all normally distributed continuous variables, a one-

way ANOVA was performed to compare the various parameters between the different divisions of the population, while for all non-normally distributed continuous variables the Kruskal-Wallis analysis was performed to compare the parameters between the groups. For all categorical variables the chi-square phi & Cramer's V statistics were used for assessing the overall significance across all the different groups. Multivariate stepwise logistic regression analysis was performed to predict which variables were independently associated with catheter trauma. The level of significance used for all of the above analyses was two tailed, $P < 0.05$. The SPSS statistical package version 13.0 was used to perform all statistical evaluation (SSPS Inc., Chicago, IL, USA).

Results

Clinical characteristics [Table 1]

The male/female ratio, the mean patients' age and the proportion of patients aged ≤ 18 or ≥ 50 years were similar in the four quartiles. Patients' clinical presentation significantly differed within the four quartiles mainly regarding two parameters: paroxysmal atrial fibrillation as the sole presenting symptom (more frequently observed in the first quartile) and palpitations without documented arrhythmias (less frequently observed in the first quartile).

Table 1. Study population

	Total (n= 508)	First quartile (n=127)	Second quartile (n=127)	Third quartile (n=127)	Fourth quartile (n=127)	P
Average no. of procedures per patient	1.13 \pm 0.40	1.24 \pm 0.59	1.09 \pm 0.28	1.06 \pm 0.27	1.12 \pm 0.37	0.002
Male gender	326 (64.2%)	86 (67.7%)	85 (66.9%)	79 (62.2%)	76 (59.8%)	0.50
Age (yrs)						
Mean patient age	33.6 \pm 15.1	32.8 \pm 14.2	33.4 \pm 15.6	33.5 \pm 15.0	34.8 \pm 15.6	0.77
No. of patients aged ≤ 18	91 (17.9%)	24 (18.9%)	24 (18.9%)	23 (18.1%)	20 (15.7%)	0.90
No. of patients aged ≥ 50	87 (17.1%)	17 (13.4%)	20 (15.7%)	24 (18.9%)	26 (20.5%)	0.44
Cardiac disease						
None	481 (94.7%)	124 (97.6%)	122 (96.1%)	117 (92.1%)	118 (92.9%)	0.16
Coronary artery disease	14 (2.8%)	1 (0.8%)	3 (2.4%)	6 (4.7%)	4 (3.1%)	0.28
Other heart diseases	13 (2.6%)	2 (1.6%)	2 (1.6%)	4 (3.2%)	5 (4.0%)	0.50
Indications for the ablation procedure						
PSVT	298 (58.7%)	80 (63.0%)	65 (51.2%)	70 (55.1%)	83 (65.4%)	0.08
PAF	31 (6.1%)	17 (13.4%)	4 (3.1%)	5 (3.9%)	5 (3.9%)	0.001
SVT + PAF	26 (5.1%)	11 (8.7%)	10 (7.9%)	3 (2.4%)	2 (1.6%)	0.01
Wide QRS	17 (3.3%)	5 (3.9%)	5 (3.9%)	3 (2.4%)	4 (3.1%)	0.88
PJRT	15 (3.0%)	3 (2.4%)	4 (3.1%)	3 (2.4%)	5 (3.9%)	0.86
VF	5 (1.0%)	3 (2.4%)	1 (0.8%)	0	1 (0.8%)	0.28
PAF + wide QRS	2 (0.4%)	0	1 (0.8%)	0	1 (0.8%)	0.57
Undocumented palpitations	89 (17.5%)	6 (4.7%)	29 (22.8%)	35 (27.6%)	19 (15.0%)	<0.0005
Asymptomatic	13 (2.6%)	2 (1.6%)	3 (2.4%)	4 (3.1%)	4 (3.1%)	0.83
Syncope	6 (1.2%)	0	2 (1.6%)	4 (3.1%)	0	0.06
Palpitations + syncope	3 (0.6%)	0	3 (2.4%)	0	0	0.03

PAF = paroxysmal atrial fibrillation, PJRT = permanent junctional reciprocating tachycardia, PSVT = paroxysmal supraventricular tachycardia, VF = ventricular fibrillation.

Table 2. Accessory pathway characteristics

	Total	First quartile	Second quartile	Third quartile	Fourth quartile	<i>P</i>
No. of APs	534	129	141	130	134	
No. of APs per patient	1.05 ± 0.25	1.06 ± 0.33	1.06 ± 0.27	1.02 ± 0.15	1.06 ± 0.23	0.56
AP type						
Manifest	250 (46.8%)	72 (55.8%)	71 (50.4%)	60 (46.2%)	47 (35.1%)	0.019
Concealed	237 (44.4%)	44 (34.1%)	57 (40.4%)	61 (46.9%)	75 (56.0%)	
Intermittent	47 (8.8%)	13 (10.1%)	13 (9.2%)	9 (6.9%)	12 (9.0%)	
AP location						
LFW	302 (56.6%)	85 (65.9%)	78 (55.3%)	66 (50.8%)	73 (54.5%)	0.15
RFW	33 (6.2%)	7 (5.4%)	6 (4.3%)	11 (8.5%)	9 (6.7%)	
PS	123 (23.0%)	24 (18.6%)	32 (22.7%)	32 (24.6%)	35 (26.1%)	
RAS	42 (7.9%)	6 (4.7%)	16 (11.3%)	12 (9.2%)	8 (6.0%)	
MS	18 (3.4%)	3 (2.3%)	2 (1.4%)	8 (6.2%)	5 (3.7%)	
RAF	16 (3.0%)	4 (3.1%)	7 (5.0%)	1 (0.8%)	4 (3.0%)	

AP = accessory pathway, LFW = left free wall, MS = midseptal, PS = posteroseptal, RAF = right atriofascicular, RAS = right anteroseptal, RFW = right free wall.

AP characteristics [Table 2]

The 508 study patients had a total of 534 APs (1.05 APs/patient) that were subjected to RFA: 485 (95.5%) patients had a single AP while 23 (4.5%) had multiple APs: 21 patients had two APs, one patient had three, and one patient had four APs. The APs were manifest, concealed or intermittent in 46.8%, 44.4% and 8.8% of cases, respectively. There was a significantly increased proportion of concealed vs. manifest APs during the study period. AP distribution was as follows: left free wall (56.6%), posteroseptal (23%), right anteroseptal (7.9%), right free wall (6.2%), midseptal (3.4%) and right atriofascicular (3.0%). There was no significant difference in AP distribution during the study period. Asymptomatic patients (n=13) were more likely to have a right free wall (46.2%) than a left free wall AP location (38.5%).

Ablation procedures

The 508 patients underwent 572 ablation procedures (1 to 4 procedures, mean 1.13 per patient) for management of their 534 APs [Table 1]. The number of procedures per patient was highest in the first quartile. In patients with left free wall APs the first ablation attempt was performed using a retrograde aortic approach (86.1%), a patent foramen ovale (7.5%), trans-septal catheterization (5.4%), a combined approach (retrograde + trans-septal) (0.7%), and into the coronary sinus (0.3%).

Acute results at a first ablation attempt

[Tables 3 and 4]

The acute successful rate at a first ablation attempt of any of the 534 APs was 93.1%, with the best (96.2%) and worst (90.7%) results obtained during the third and first quartiles, respectively. The acute failure rate was 3.7% with the highest (7.8%) and lowest (1.5%) figures observed during the first and third quartiles, respectively. The highest rate of procedures that were discontinued or not attempted was observed during the fourth quartile (5.2%).

The successful ablation rates for the various AP locations were as follows: midseptal (100%), left free wall (96%), right free wall (93.9%), posteroseptal (92.7%), right atriofascicular (81.3%) and right anteroseptal (73.8%). Failure rates were the highest for right atriofascicular APs (12.5%). An AP location at the right anteroseptal area was associated with the highest rate (21.5%) of procedures that were discontinued or not attempted. The success rates

were 95.2%, 92.8% and 83% for manifest, concealed and intermittent APs, respectively (*P* = 0.31 between manifest and concealed). In patients with left free wall APs (n=302), acute success rates were 96.5% and 94.9% for the retrograde aortic and trans-septal approaches, respectively (*P* = 0.6).

The number of RF pulses delivered during successful ablation procedures (mean 5.7 ± 6.5) decreased progressively during the study period (6.9 ± 7.7, 5.9 ± 7.2, 5.0 ± 5.4 and 5.0 ± 5.4 during the first, second, third and fourth quartiles, respectively, *P* for trend = 0.01). In patients with left free wall APs, the number of successful RF pulses was significantly lower when using a trans-septal (3.0 ± 2.9) than a retrograde approach (5.2 ± 5.1) (*P* < 0.001).

Table 3. Overall results of the first ablation procedure

	Total		First quartile		Second quartile		Third quartile		Fourth quartile		<i>P</i>
	N	%	N	%	N	%	N	%	N	%	
Success	497	93.1	117	90.7	133	94.3	125	96.2	122	91.0	0.003
Failure	20	3.7	10	7.8	3	2.1	2	1.5	5	3.7	
Discontinued	5	1	0	0	0	0	0	0	5	3.7	
Not attempted	12	2.3	2	1.6	5	3.5	3	2.3	2	1.5	
Total	534		129		141		130		134		

Table 4. Results of first ablation procedure according to AP location

	Total		LFW		RFW		PS		RAS		MS		RAF		<i>P</i>
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
Success	497	93.1	290	96.0	31	93.9	114	92.7	31	73.8	18	100	13	81.3	< 0.0001
Failure	20	3.7	8	2.6	2	6.1	7	5.7	1	2.4	0	0	2	12.5	
Discontinued	5	1.0	2	0.7	0	0	0	0	3	7.2	0	0	0	0	
Not attempted	12	2.3	2	0.7	0	0	2	1.6	7	16.7	0	0	1	6.3	
Total	534		302		33		123		42		18		16		

LFW = left free wall, MS = midseptal, PS = posteroseptal, RAF = right atriofascicular, RAS = right anteroseptal, RFW = right free wall.

Recurrence of AP conduction after a first successful procedure

Recurrence of AP conduction after a successful initial ablation procedure was observed in 49 (9.9%) of 497 APs. Recurrence rates were 24.2%, 16.7%, 14.3%, 13%, 6.3% and 5.0% for right free wall, midseptal, right anteroseptal, posteroseptal, right atriofascicular and left free wall APs, respectively. Recurrence rates were 9.7% and 7.3% for manifest and concealed APs, respectively ($P = 0.36$). In patients with left free wall APs, recurrences of AP conduction were 4.7% and 7.7% for the retrograde aortic and trans-septal approaches, respectively ($P = 0.4$).

Overall results of ablation

Analysis of the acute results of ablation of the 534 APs achieved during at least one procedure showed an overall success rate of 95.3%. Of the 25 patients in whom the last ablation procedure failed, was discontinued or not attempted, 9 had a right anteroseptal AP, 7 a posteroseptal AP, 6 a left free wall AP, 2 a right atriofascicular AP and 1 had a right free wall AP. During follow-up, recurrent AP conduction was still present in two patients (both with posteroseptal APs) who had successful ablation at their last procedure. A 94.9% rate of definite cure was achieved during follow-up of 85 ± 43 months (range 0–167 months). The definite success rates were as follows: midseptal (100%), left free wall (98%), right free wall (97%), posteroseptal (92.7%), right atriofascicular (87.5%) and right anteroseptal (78.5%).

Complications

Non-fatal acute complications occurred in 18 patients (3.5%) during the 572 ablation procedures (3.1% per procedure). In patients subjected to multiple procedures, the complication occurred during only one of them. The complication rates per procedure were 4.9%, 4.2%, 2.2% and 1.4% in the first, second, third and fourth quartiles, respectively ($P = 0.27$). Complications were more frequent in females (6.6%) than in males (1.8%) ($P < 0.01$).

- A pericardial effusion was observed in 7 patients (1.4%) (6 females) and required pericardiocentesis in 2. Five of these seven patients (all females) underwent RFA of a left free wall AP using the retrograde approach. The incidence of pericardial effusion in females (3.2%) was significantly higher than in males (0.3%) ($P < 0.01$). Most cases of pericardial effusion ($n=5$) occurred during the first two quartiles while only one case occurred during the third and fourth quartiles each.
- High degree AV nodal block occurred in 3 patients (0.6%): transient 2:1 AV block in a patient during RFA of a posteroseptal AP, and complete AV block during RFA of a posteroseptal ($n=1$) or right anteroseptal AP ($n=1$). A permanent pacemaker was implanted in the latter two patients (0.4%) due to associated damage caused to the AP. Both patients were studied at the beginning of our experience.
- Acute myocardial ischemia was observed in 4 patients (0.8%) (2 females) all undergoing RFA of a left free wall AP using the retrograde aortic approach. In one patient, severe tachycardia-induced myocardial ischemia developed before

any RF pulse delivery and prompted procedure discontinuation. The three other patients developed transient myocardial ischemia presumably due to a spasm in the territory of the left circumflex artery during RF pulse delivery. One of them (a 9.5 year old boy) underwent coronary angiography that showed normal results.

- Peripheral vascular complications occurred in three female patients (0.6%), all undergoing RFA of a left free wall AP using the retrograde approach: retroperitoneal hematoma that slowly resolved ($n=1$), entrapment of a diagnostic catheter in a femoral vein that required surgical removal ($n=1$), and a false femoral pseudo-aneurysm treated with compression ($n=1$).
- In one male patient (0.2%), severe mitral valve insufficiency developed early following RFA of a left free wall AP using the retrograde approach after failure to ablate the AP via a trans-septal approach during the same procedure. The patient underwent surgical mitral valve repair as well as successful cryosurgery ablation of the AP. Another of our patients (the 9.5 year old boy who exhibited acute coronary spasm) developed progressive severe mitral valve insufficiency requiring surgical repair 11.5 years following four procedures required to abolish a left free wall AP using the retrograde approach (prior bilateral ligation of femoral veins during infancy prevented the trans-septal approach).

Although the incidence of significant complications (AV nodal blocks excluded) was higher in patients undergoing ablation using a retrograde approach (5%) than in those using a trans-septal approach (0%), the difference did not reach statistical significance ($P = 0.15$).

Catheter mechanical trauma

Catheter-induced mechanical trauma to APs was observed in 56 cases (10.5%). The incidence of AP trauma was 3.1%, 14.9%, 8.5% and 14.9% in the first, second, third and fourth quartiles, respectively ($P = \text{NS}$). In patients who underwent multiple ablation procedures, mechanical trauma to the AP developed during only one of the procedures.

The incidence of trauma according to AP location was as follows: right atriofascicular (43.8%), right anteroseptal (38.1%), right free wall (9.1%), posteroseptal (8.1%), left free wall (6.3%) and midseptal (5.6%). The ablation procedure had to be discontinued or were not attempted in 14.3% of cases complicated with trauma and in 1.9% of cases not complicated with trauma ($P < 0.001$). Also, the procedure success rate was lower in patients with trauma than in patients without trauma (85.7% vs. 93.9%, $P < 0.001$). Logistic regression analysis with AP trauma as a dependent variable, and patient age, gender, AP type and number of APs as independent variables showed that AP location was the only predictor of AP trauma. An anteroseptal location compared to a left free wall location had an odds ratio of 9.2 (95% confidence interval 4.2–19.9), while a right atriofascicular AP location compared to a left free wall location had an odds ratio of 11.6 (95% confidence interval 3.9–34.5).

AV = atrioventricular

Discussion

Patient characteristics

The male prevalence (64.2%), the patients' mean age (33.6 years) and the lack of demonstrable heart disease (94.7%) in our study population are consistent with that reported from non-pediatric electrophysiology laboratories [1-10]. Also, the overwhelming majority (97.4%) of patients studied over the years were symptomatic with only a slight increase over the years of asymptomatic patients undergoing RFA. It is likely that this figure will increase in the future following the recent publication by Pappone et al. [12]. The anatomic preponderance of left free wall and posteroseptal AP locations in our study is also consistent with that reported in most series [1-10].

Factors affecting ablation success and recurrence

The results of the present study are consistent with those of previous reports, including multi-center studies [1-10,13-15], with regard to the following:

- acute successful ablation rates of 93.1% and 95.3% for a first or multiple ablation attempts, respectively
- a slightly higher success rate for left free wall APs as compared with posteroseptal and right free wall APs
- higher recurrence rates after a successful ablation procedure for posteroseptal and right free wall APs than for a left free wall AP
- a definite cure of the APs in 95% of patients following one or multiple RFA procedures.

In contrast to the findings of Laurent et al. [10], our learning curve was achieved quickly because our success rate during the first quartile was relatively high and even similar to that observed during the fourth quartile. In congruence with most previous studies [1-9], we found no significant differences between the acute success and recurrence rates between manifest and concealed APs.

Our results confirm those of previous studies showing that the trans-septal approach was as effective as the retrograde approach and allowed a smaller number of RF applications [16,17]. Taking into account the safety of this approach as compared to the significant complications observed using the retrograde approach in our early experience (see below), we currently routinely use the trans-septal approach for ablating left free wall APs.

Complications

In our study acute significant complications occurred in 18 patients (3.5%) (3.1% per procedure), in concordance with that reported in the largest series [7,9,18]. It is noteworthy, however, that most of the complications were observed at the beginning of our experience and that the complication rate progressively decreased from 4.9% in the first quartile to 1.4% in the fourth quartile. Importantly, the two most important complications (pericardial effusion and myocardial ischemic events) mainly occurred during RFA of a left free wall AP using the retrograde approach. In contrast, no such complications were observed

when we used the trans-septal approach, suggesting that the latter method might be safer. However, a comparison of the two approaches cannot be made from our data. Results from other comparative studies actually showed a similar safety with both techniques [16,17].

The incidence of inadvertent AV blocks requiring implantation of a permanent pacemaker was small (0.2%), involving only septal APs ablated at the very beginning of our experience. It should be noted, however, that the ablation procedure was discontinued or not attempted when the risk of AV block was estimated to be high, especially for right anteroseptal or para-Hissian AP locations.

In four patients, various complications resulted from catheter placement and manipulation, including severe mitral valve damage due to entrapment of the ablation catheter in one patient, as previously reported by others [19,20]. The very late development of severe mitral insufficiency in the 9.5 year old boy suggests that such an exceptional complication [21,22] should be looked for during follow-up of patients who underwent RFA of left free wall APs.

Finally, our study showed that the overall complication rate was unexpectedly higher in females (6.6%) than in males (1.8%). This gender difference was even more marked when considering pericardial effusion alone (10:1 ratio). This is consistent with the Mayo Clinic experience, showing a female prevalence of cardiac perforation in patients undergoing various catheter-based procedures [23,24].

Mechanical trauma to APs

The results of the present study showing a 10.5% incidence of AP trauma confirm our previous initial results [25] and suggest that this complication is far from negligible when thoroughly sought for. In addition, the occurrence rate of this complication has remained unchanged over the years despite the accumulation of experience. As in our previous study [25], we found that right atriofascicular and right anteroseptal APs were extremely sensitive to mechanical trauma (43.8% and 38.1% incidence rate, respectively) but that other pathway locations were not spared. Although mechanical trauma to APs is short-lasting and without major consequences in most patients, it may have significant consequences in others as it may render the ablation procedure impossible or difficult to perform, leading to its discontinuation. This could explain in part the poor results of RFA in our study at a first ablation attempt of right atriofascicular and anteroseptal APs.

Study limitations

Since our study did not include patients younger than 9.5 years or those with complex cardiac congenital abnormalities, the results in terms of success and complication rates should not be extrapolated to these patient groups.

Conclusions

These results confirm the efficacy and safety of RFA and suggest that it is a reasonable first-line therapy in the management of

APs at any location. Most of the significant complications were observed at the beginning of our experience during ablation of left free wall APs using a retrograde approach. A trans-septal technique seems beneficial for decreasing the rate of complications in these patients. Mechanical trauma to APs is more common than previously recognized and may significantly affect the procedure outcome.

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If I am walking with two other men, each of them will serve as my teacher. I will pick out the good points of the one and imitate them, and the bad points of the other and correct them in myself.

Confucius (551-478 BCE), Chinese philosopher and teacher