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ARTYKUŁ ORYGINALNY / *ORIGINAL ARTICLE*

Ablation of atrioventricular nodal reentrant tachycardia: predictors of long-term success

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Abstract

Background: Atrioventricular nodal reentrant tachycardia (AVNRT) is the commonest regular supraventricular tachyarrhythmia. Ablation in the area of slow pathway (SP) has been successfully implemented in everyday clinical electrophysiological practice for more than 20 years. Although the procedure is generally regarded as effective and safe, data on long-term effects and predictors of success or failure are incomplete.

Aim: To identify predictors of successful AVNRT ablation.

Methods: The study group consisted of 359 patients (105 males, mean age 51.1 ± 16.7 years) who underwent AVNRT radiofrequency ablation using typical combined electrophysiological and anatomical approach.

Results: Acute success was achieved in 342 (95%) patients, including 187 (52%) with SP ablation and 155 (43%) with SP modification. Patients with SP modification were younger, had shorter AVNRT cycle length, less often had typical echo, and had more frequent isoproterenol usage after ablation. Long-term follow-up data was available for 308 patients (86% of the total study group). During the mean follow-up of 52.9 ± 27.3 months (median 48, range 12–130 months), 22 patients experienced AVNRT recurrences (long-term efficacy 93%). These patients had less often complete SP abolition than SP modification (27% vs. 56%, $p < 0.001$) and typical jump (vs. no jump or multiple jumps) at baseline (74% vs. 89%, $p < 0.06$) than patients without recurrences. Multivariate Cox regression analysis showed that typical jump was associated with a favourable outcome (HR 5.8, 95% CI 0.44–3.1, $p = 0.0089$). There were no significant differences in the use of 2 or > 2 electrode approaches between patients with or without AVNRT recurrences.

Conclusions: Typical jump and complete SP elimination are associated with a better outcome. A 2-electrode approach is as effective as > 2 electrode approach. The electrophysiological profile of patients in whom complete SP elimination was achieved may differ from that of patients in whom only SP modification was possible.

Key words: atrioventricular nodal reentrant tachycardia, ablation, efficacy

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INTRODUCTION

Atrioventricular nodal reentrant tachycardia (AVNRT) is the commonest regular supraventricular tachyarrhythmia [1]. Ablation in the area of slow pathway (SP) has been successfully implemented in everyday clinical electrophysiological practice for more than 20 years [2]. Although the procedure is generally regarded as effective and safe, data on long-term effects and predictors of success or failure are incomplete. Such issues as SP ablation vs. modification or the use of isoproterenol have been addressed by a few studies to date, but results are not concordant [3–8].

Therefore, the aim of our study was to assess the long-term success and predictors of the outcome in a large, homogenous population of patients with AVNRT, treated

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by a single team of electrophysiologists, who used the same technique for AVNRT ablation.

METHODS

We performed retrospective analysis of our database of consecutive patients who underwent AVNRT ablation between 2000 and 2009. All clinical, demographic and procedural parameters were derived from the database and analysed. The follow-up was performed between March and June 2011 by outpatient visits, telephone conversation or via a postal survey.

Patients

The study group consisted of 359 patients (105 males, mean age 51.1 ± 16.7 years) with a history of palpitations due to AVNRT (mean 133.4 ± 146 months) who underwent AVNRT ablation performed by the same team of three experienced electrophysiologists (PK, SMS and TK). All patients had symptoms due to AVNRT attacks and underwent ablation after at least one antiarrhythmic drug treatment failure. In all patients a detailed history was taken, including duration of AVNRT-associated symptoms and approximate number of symptomatic AVNRT, as estimated by the patient. Detailed cardiovascular evaluation, including echocardiography and other tests as needed, was performed.

Ablation protocol

The procedure was performed in non-sedated patients after informed written consent had been obtained. The catheters were inserted via the right femoral vein. Between 2000 and 2006, 3 or very rarely — 4 catheters (5 patients) (2/3 diagnostic and 1 ablation) were inserted and placed in the coronary sinus (CS), His bundle area and right ventricle (RV) in 140 patients. From 2006, only two catheters (1 in CS and 1 ablation) were used in the subsequent 219 patients. The diagnostic part of the procedure consisted of standard assessment of retrograde and anterograde conduction. The diagnosis of AVNRT was based on the presence of jump and echo initiating tachycardia during programmed atrial stimulation and/or during incremental atrial pacing close to the Wenckebach point. Typical jump was defined as a sudden prolongation of A-H interval > 50 ms with an increase of 10 ms of S1–S2 interval during programmed atrial pacing. When this interval was shorter, there was more than one jump or there was no jump at all, this phenomenon was called 'non-typical jump'. Typical AVNRT was diagnosed when the earliest retrograde atrial activation during tachycardia was < 70 ms from the ventricular activation and was concentric (recorded from CS), matching that during RV pacing. In each patient, discrimination pacing manoeuvres were used in order to exclude retrograde activation via accessory pathway. Atypical AVNRT was diagnosed when retrograde atrial activation during tachycardia was via slow or intermediate nodal pathway resulting in long R-P interval.

In patients without inducible AVNRT, isoproterenol was used in incremental doses in order to facilitate AVNRT induction. Patients in whom AVNRT was not inducible but there was a jump with echo and ECG documentation of clinical AVNRT also underwent ablation.

Ablation was performed using a 4 mm radiofrequency (RF) ablation catheter (Cordis Webster or Biotronik) with power set at 35 Watts and temperature at 55°C. The standard electroanatomical approach was used targeting the SP area close to the CS os. We usually started slightly below the CS os and subsequently placed the ablation electrode higher towards the His area if previous applications had been ineffective. After each application which resulted in junctional rhythm, AVNRT inducibility was checked using the same protocol as prior to ablation. When there was no junctional rhythm during RF current delivery, the application was stopped after 15–20 s and the ablation catheter was moved to another place. The end-point of ablation was ablation of SP or modification of SP which included the presence of a jump, echo or both. In patients in whom isoproterenol was needed to induce AVNRT at baseline, post-ablation pacing was also performed after drug infusion. In patients in whom isoproterenol was not necessary to induce AVNRT at baseline, the post-ablation use of isoproterenol was left to the operator discretion. In each patient there was at least a 10 min waiting period after the last RF application to ensure a durable effect of ablation. In some patients in whom arrhythmia was difficult to induce, other maneouvres such as hand grip or atropine injection were also used. Heparin was not routinely administered. Apart from switching from 3–4 to two catheters in 2006, all the procedures were performed in a uniform fashion throughout the whole analysed period.

Acute success of RF ablation was defined as non-inducibility of AVNRT without the presence of residual jump and/or echo (SP ablation) or the presence of only a single jump and/or echo (SP modification).

Follow-up

The patients were contacted personally in the outpatient clinic or by phone or mail. The final follow-up was performed between March and June 2011. The primary follow-up end-point was the first recurrence of symptomatic AVNRT, documented on ECG. Other analysed end-points included antiarrhythmic drugs usage, need for another ablation, and other cardiovascular or non-cardiovascular major events.

Statistical analysis

Results are presented as mean ± SD or numbers and percentages. Differences in analysed parameters were assessed using Student t-test for numerical variables and χ^2 test for qualitative parameters. Linear correlation coefficients were calculated to assess the relationship between analysed parameters. A multivariate Cox regression analysis was used to identify parameters which independently predicted the outcome of ablation. A Kaplan-Meier curve was drawn to show the probability of recurrence. A p value < 0.05 was considered significant.

RESULTS

The peri-procedural data are summarised in Table 1. At baseline, AVNRT was induced in 316 (86%) patients, including 24 (7%) atypical forms of AVNRT. Acute success was achieved in 342 (95%) patients, including 187 (52%) with SP ablation and 155 (43%) with SP modification. In the remaining 17 (5%) patients, the procedure was deemed unsuccessful due to persistent inducibility of AVNRT or the presence of more than one echo. In two patients, successful SP ablation was performed from the left side using a retrograde aortic approach targeting left mid- to postero-septal area close to the right-sided CS os with the induction of junctional rhythm.

Table 1. Periprocedural data (n = 359)

Parameter	Result
Number of electrodes: 2/3/4	219/135/5 (61%/38%/1%)
AVNRT inducible	316 (88%)
AVNRT cycle length [ms]	353 ± 63
Typical jump	314 (87%)
Typical echo	329 (92%)
Isoproterenol use before ablation	137 (38%)
Isoproterenol use after ablation	147 (41%)
Number of RF applications	12 ± 13
Slow pathway ablation	187 (52%)
Slow pathway modification	155 (43%)
Ablation ineffective (> 1 echo)	17 (5%)
Nodal rhythm during ablation	344 (96%)
Other arrhythmias	84 (23%)
Procedure duration [min]	59 ± 27
Fluoroscopy time [min]	13 ± 10

AVNRT — atrioventricular nodal reentrant tachycardia; RF — radiofrequency

In eight patients, ablation of other arrhythmia (3: WPW, 2: atrial flutter, 2: atrial tachycardia, and 1: ventricular ectopy) was also performed during the same session. In five patients with a 3-electrode approach, an additional electrode was inserted due to diagnostic problems.

There was no case of persistent complete atrioventricular (AV) block requiring urgent pacemaker implantation. There were seven patients with baseline prolonged PR interval but dual AV conduction. After ablation in two patients, PR interval shortened, and in the remaining five did not change significantly. In one of these patients, elective pacemaker implantation was performed after AVNRT ablation due to PR of 260 ms (before and after ablation) combined with sinus bradycardia. Altogether, in one patient transient complete AV block and in two transient second-degree AV block occurred during RF delivery, but these conduction abnormalities were transient and resolved after < 1 min.

The procedure-related complications included one arterio-venous fistula and one massive groin haematoma requiring blood transfusion.

In Table 2, the procedural parameters are compared between patients with SP ablation vs. modification. Patients with SP modification were younger, had shorter AVNRT cycle length, less often had typical echo and had more frequent isoproterenol usage after ablation. The number of RF applications, procedure duration and fluoroscopy time were significantly higher in patients with SP modification than in those with SP ablation.

Long-term follow-up data were available for 308 patients (86% of the total study group). The demographic and clinical characteristics of the 51 patients who were lost to follow-up were similar to those of the 308 patients with available follow-up data [age: 48 ± 16 vs. 52 ± 17 years, males: 15 (29%) vs. 89 (29%), duration of symptoms:

Table 2. Comparison of periprocedural data between patients with slow pathway ablation vs. slow pathway modification

Parameter	Slow pathway ablation (n = 187)	Slow pathway modification (n = 172)	P
Age [years]	53 ± 18	49 ± 16	< 0.05
Gender (males/females)	63 (34%)	41 (24%)	NS
Number of electrodes: 2/3	119 (64%)	100 (58%)	NS
AVNRT inducible	164 (88%)	152 (88%)	NS
AVNRT cycle length [ms]	361 ± 64	341 ± 67	< 0.04
Typical jump	167 (89%)	148 (86%)	NS
Typical echo	171 (91%)	116 (67%)	< 0.001
Isoproterenol use before ablation	64 (34%)	73 (42%)	NS
Isoproterenol use after ablation	63 (34%)	84 (49%)	< 0.001
Number of RF applications	10 ± 11	15 ± 14	< 0.002
Nodal rhythm during ablation	180 (96%)	164 (95%)	NS
Procedure duration (min)	52 ± 22	69 ± 31	< 0.0005
Fluoroscopy time (min)	11 ± 8	16 ± 12	< 0.001

AVNRT — atrioventricular nodal reentrant tachycardia; RF — radiofrequency

103 ± 76 vs. 134 ± 148 months, number of AVNRT episodes: 158 ± 152 vs. 175 ± 306, presence of organic heart disease: 6 (12%) vs. 50 (16%), all differences NS].

During the mean follow-up of 52.9 ± 27.3 months (median 48, range 12–130 months), 22 patients experienced AVNRT recurrences; this transfers into long-term efficacy of the procedure of 93%. In this group, six (27%) patients had SP ablation, 11 (50%) had SP modification, and five (23%) had more than one echo or inducible AVNRT after the procedure. In ten of these patients, a successful second AVNRT ablation was performed, whereas the remaining patients continued pharmacological therapy.

First AVNRT recurrence occurred from seven days to six years after ablation (mean 640 ± 688 days). There was no significant difference in the time from ablation to arrhythmia recurrence between patients with SP ablation vs. SP modification. The probability of AVNRT recurrence over the follow-up period is presented in Figure 1.

There were no significant differences between the operators' efficacy. Operator 1 performed 121 procedures of which 116 (96%) were successful during long-term follow-up, operator 2 performed 73 procedures of which 65 (89%) were successful, and operator 3 performed 114 procedures of which 105 (92%) were effective (differences NS).

There were seven deaths during the follow-up period: three patients died due to neoplastic disease, one due to heart failure, one due to chronic kidney disease and one of an unknown cause. None of the deceased patients had AVNRT recurrences during the follow-up period. Other significant events which occurred during follow-up included two pacemaker implantations nine months and nine years after AVNRT ablation.

Table 3 shows a comparison of demographic, clinical and ablation parameters of patients with or without AVNRT recurrence. Patients with AVNRT recurrence had significantly less often complete SP abolition than patients without recurrences (27% vs. 56%, $p < 0.001$). Typical jump at baseline was more frequently observed in patients successfully treated with ablation; however, the difference was of borderline significance. An unsuccessful procedure (≥ 2 echos) resulted in a significantly higher recurrence rate of AVNRT. The use of antiarrhythmic drugs was significantly higher in patients with rather than without arrhythmia recurrences. In 35 patients out of those 286 without AVNRT recurrences, antiarrhythmic drugs were used due to sinus tachycardia (n = 5), atrial fibrillation (n = 19), paroxysmal atrial tachycardia (n = 6), symptomatic atrial ectopic beats (n = 2), ventricular ectopic beats (n = 2) and without apparent indication in one patient. In 22 patients with AVNRT recurrence, antiarrhythmic drugs were predominantly (55%) used to suppress further AVNRT recurrences. There were no significant differences in the use of 2 or > 2 electrodes between patients with SP modification or ablation, nor between patients with or without AVNRT recurrences during follow-up.

Linear correlation coefficients between selected procedural data are shown in Table 4.

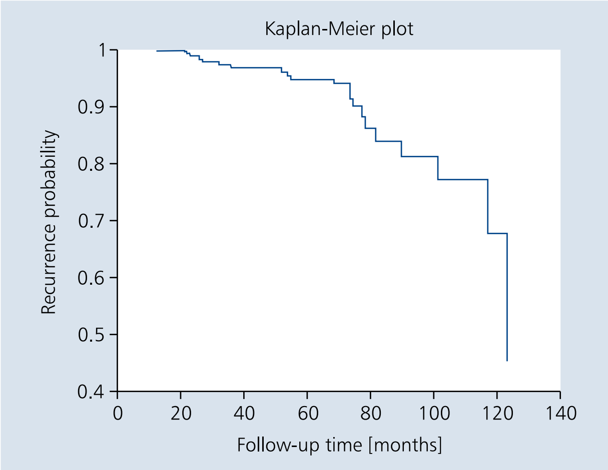

Figure 1. Kaplan-Meier curve showing probability of atrioventricular nodal reentrant tachycardia recurrence during follow-up

Out of 11 patients who had an acutely unsuccessful procedure (≥ 2 echo remaining) but had no recurrence during follow-up, five had 2–4 echos whereas the remaining six had sustained AVNRT still inducible after the procedure (Table 5). Seven of these 11 patients were on long-term pharmacology, including five on beta-blockers, one on propafenone and the remaining one on beta-blockers and propafenone. In both patients receiving propafenone, the drug was administered due to paroxysmal atrial fibrillation.

Table 6 depicts the results of multivariate analysis which showed that typical jump was independently associated with favourable outcome, whereas the persistence of more than one echo (including still inducible AVNRT) identified non-responders. Complete SP elimination was not an independent variable predicting successful long-term outcome.

DISCUSSION

The main finding of the present study is that SP ablation yields better long-term results than SP modification, although is not an independent predictor of successful outcome. Typical jump, contrary to no jump or multiple jumps, was such an independent variable. Our study also showed that first AVNRT recurrence may occur as late as six years after ablation, that a 2-electrode approach is as safe and effective as > 2 electrode approach, and that the electrophysiological profile of patients in whom complete SP elimination was achieved may differ from that of patients in whom only SP modification was possible.

Slow pathway ablation vs. modification

Data concerning this important issue are conflicting. Although it has been accepted that SP modification may serve as a reliable end-point of successful AVNRT ablation [6, 8–10], some studies have shown that the recurrence rate is higher in patients

Table 3. Comparison of demographic, clinical and procedural data between patients without AVNRT recurrence and with AVNRT recurrence during follow-up

Parameter	AVNRT recurrence (n = 22)	No AVNRT recurrence (n = 286)	P
Age [years]	56 ± 17	51 ± 17	NS
Male gender [%]	3 (14%)	86 (30%)	NS
Duration of symptoms due to AVNRT [months]	162 ± 183	132 ± 146	NS
Number of AVNRT episodes	294 ± 588	166 ± 306	NS
Organic heart disease	2 (9%)	47 (16%)	NS
Follow-up duration [months]	61 ± 32	52 ± 29	NS
Two-electrode approach	11 (50%)	185 (65%)	NS
AVNRT inducible	20 (91%)	250 (87%)	NS
AVNRT cycle length [ms]	344 ± 58	355 ± 65	NS
Typical jump before ablation	16 (74%)	254 (89%)	< 0.06
Typical echo before ablation	19 (86%)	262 (92%)	NS
Nodal rhythm during RF application	20 (91%)	275 (96%)	NS
Isoproterenol use before ablation	10 (45%)	106 (37%)	NS
Isoproterenol use after ablation	9 (41%)	115 (40%)	NS
Number of RF applications	16 ± 17	11 ± 11	NS
Other arrhythmias during ablation	6 (27%)	63 (22%)	NS
Procedure regarded successful (SP ablation or modification)	17 (77%)	274 (96%)*	< 0.001
Including:			
SP ablation	6 (27%)	161 (56%)	< 0.025
SP modification (residual jump and/or max 1 echo)	11 (50%)	113 (40%)	NS
Procedure regarded as unsuccessful (≥ 2 echo)	5 (23%)	11 (4%)	< 0.001
Procedure duration [min]	83 ± 40	57 ± 26	0.1
Fluoroscopy time [min]	17 ± 12	12 ± 10	0.33
Antiarrhythmic drugs (including beta-blockers) due to arrhythmia during follow-up	12 (55%)	35 (12%)	< 0.001
Beta-blockers due to non-arrhythmic indications (hypertension, CAD or CHF) during follow-up	5 (23%)	84 (29%)	NS

*One patient developed atrial fibrillation during ablation which could not be terminated and therefore the assessment of duality of atrioventricular node and atrioventricular nodal reentrant tachycardia (AVNRT) inducibility was not possible; CAD — coronary artery disease; CHF — congestive heart failure; SP — slow pathway; RF — radiofrequency

Table 4. Linear correlation coefficients between selected procedural data

	Typical echo	Typical jump	SP ablation	≥ 2 echo
Typical echo	1	–0.5917	0.1146	0.3562
Typical jump	–0.5917	1	–0.1565	–0.2339
SP ablation	0.1146	-0.1565	1	0.3696
≥ 2 echo	0.3562	-0.2339	0.3696	1

SP — slow pathway

who underwent only SP modification [11]. It could be that in a case of SP modification the RF injury to SP is incomplete and conduction over SP may resume over months or years. Recent data from cryoablation procedures are even more homogenous and strongly suggest that complete SP elimination should be the preferred ablation end-point [12–14]. Thus, when during the course of ablation procedure a SP modification is achieved, it is worth attempting to perform additional RF applications in order to achieve complete SP ablation, especially in patients with a large echo window [8, 13] or in whom the AV nodal refractory period is only slightly prolonged following ablation [13]. Obviously, these additional applications, which are usually performed closer to the AV node than initial ones, should be performed with maximal care, taking into account the distance from ablation electrode to the His area and the rate of junctional rhythm as well as preserved retrograde atrial activation

Table 5. Details on 11 patients with initially ineffective procedure who had no recurrences during follow-up

Age [years]	Sex	Symptom duration [months]	No. of AVNRT episodes	Typical echo	Typical jump	Nodal rhythm during RF	No. of echo or AVNRT still inducible	Iso after	F-U [month]	Drugs during F-U
63	F	72	16	Yes	Yes	Yes	3	Yes	35	(–)
29	F	120	65	No	Yes	No	AVNRT	No	21	BB
33	F	72	3	Yes	Yes	Yes	AVNRT	Yes	50	BB
25	F	6	100	Yes	Yes	Yes	4	Yes	69	(–)
69	M	48	100	No	No	Yes	4	No	73	BB
30	F	168	100	No	No	Yes	2	Yes	75	(–)
49	F	24	24	Yes	Yes	Yes	AVNRT	Yes	75	BB
58	F	60	100	Yes	Yes	Yes	2	No	41	PFN
32	F	60	160	No	No	No	AVNRT	No	77	BB
33	M	N/A	N/A	Yes	Yes	Yes	AVNRT	No	88	(–)
68	F	36	36	Yes	Yes	Yes	AVNRT	Yes	21	BB + PFN

AVNRT — AVNRT still inducible after ablation; BB — beta-blocker; PFN — propafenone (in both patients administered due to paroxysmal atrial fibrillation); F-U — follow-up, Iso — isoproterenol; AVNRT — atrioventricular nodal reentrant tachycardia; F — female; M — male; N/A — not available

Table 6. Results of multivariate Cox regression analysis

Variable	Regression coefficient (b)	Standard error SE(b)	P value	e^b: hazard ratio	95% CI for hazard ratio	
					Lower	Upper
Typical echo	–1.0088	0.8806	0.2520	0.3647	–2.7348	0.7172
Typical jump	1.7599	0.6729	0.0089	5.8119	0.4410	3.0788
SP ablation	0.5608	0.5091	0.2707	1.7521	–0.4371	1.5586
≥ 2 echo	–1.4437	0.6076	0.0175	0.2361	–2.6345	–0.2529

CI — confidence interval; SP — slow pathway

via fast pathway during RF delivery. However, it should be also kept in mind that even using SP modification as an end-point, AVNRT ablation is highly effective and pursuing SP ablation may increase the efficacy rate only slightly.

In patients with favourable outcome, SP ablation was not an independent predictor of long-term success in multivariate analysis, whereas the presence of typical jump was an independent variable. It could be that the failure of SP ablation to be an independent parameter may be due to a relatively low number of patients with recurrences. Linear regression analysis showed that SP ablation was much less related to other electrophysiological parameters (jump and echo) which may suggest that indeed it gives additional information. The fact that typical jump was an independent variable may suggest that these patients had more standard and hence easier to ablate substrate for arrhythmia than those without typical jump or multiple jumps, suggesting the presence of more than one anterogradely conducting slow AV nodal pathways.

Overall, our long-term efficacy rate of 93% is within the reported AVNRT ablation efficacy range (recurrence rate from 0.8% to 26.7%) [9]. The median follow-up duration in our study (4 years) was considerably longer than in many other reports, which substantiates our findings. However, our results indicate that first AVNRT recurrence may occur late after ablation, as much as six years after the procedure. In our group the mean time to recurrence was nearly two years. This implies that studies assessing the efficacy of AVNRT ablation should have a long follow-up duration (preferably > 6 years) in order to obtain reliable data on procedural efficacy.

Of note, not all patients with acute failure of ablation suffered from recurrences. In our study there were 11 such patients, including six with not only multiple echos but also inducible sustained AVNRT. This suggests that in some patients a late healing/scarring process may take place or there is a lack of extra beats triggering AVNRT during everyday life which prevent AVNRT recurrences. Seven of these 11 patients were, however, on prolonged treatment with beta-blockers or propafenone or both, which obviously may have a significant impact on AVNRT recurrences.

Procedural issues

Our study showed that a 2-electrode approach is as safe and effective as a > 2 electrode approach. This has also been shown by others [15]. An electrode in the CS enables pacing from atrium and analysing retrograde atrial activation whereas ablation electrode serves for ventricular stimulation during baseline electrophysiological study, followed by identification of His potential area, recording A-H and H-V intervals during atrial pacing, and finally for delivery of RF current at the SP site. This approach is cheaper and less invasive for a patient (only 2 punctures of the femoral vein on 1 side) than a standard 3-electrode procedure.

The mean number of RF applications was rather high in our study compared to other reports; however, we counted all RF applications, including those ineffective (terminated within 15–20 s when no nodal rhythm was evoked) and those which had to be stopped due to other reasons such as electrode displacement.

In patients with SP modification, isoproterenol use after ablation was left to the discretion of the operator. Therefore, the usefulness of isoproterenol for the assessment of ablation efficacy cannot be systematically assessed in our study. Thus, we were not able to confirm the predictive value of isoproterenol use for AVNRT recurrences during follow-up. One meta-analysis showed that post-ablation isoproterenol infusion should be routinely used, especially in patients with residual jump and/or echo. With the uniform usage of isoproterenol after the procedure, there was no difference in recurrence rate between patients with complete SP elimination vs. SP modification [9].

Patients with SP ablation vs. modification

Our results showed that patients with SP modification were younger, had faster AVNRT, more often received isoproterenol after ablation, and had a higher number of applications as well as procedural and fluoroscopy time. These findings may in part be due to the fact that operators aimed at SP ablation rather than only modification (higher number of applications and procedural duration); however, it is also possible that in patients in whom SP modification was only achieved, AVNRT characteristics were different from those in patients with complete SP elimination. The former patients had shorter cycle of AVNRT which may suggest smaller reentry circuit. Another possible explanation as to why in these patients only SP modification was achieved, is that SP was localised closer to the AV node and operators were reluctant to pursue ablation higher in the septum. However, this issue was not systematically examined in our study.

Limitations of the study

This study has several limitations. Firstly, this was a retrospective study with all the inherent limitations of that type of analysis. Secondly, the follow-up data was not complete (86% of patients), although demographic and clinical data of patients lost to follow-up were similar to patients with follow-up data available, which suggests that our results were not significantly affected by incomplete follow-up. Thirdly, some detailed electrophysiological parameters such as the range of coupling intervals of extra beats at which residual echo was present (large or short echo window), were not systematically collected. Fourthly, isoproterenol was not used in all patients after ablation which precluded meaningful analysis of the predictive role of post-ablation isoproterenol usage.

CONCLUSIONS

Our study produced further evidence that complete SP elimination may be associated with a better outcome than SP modification. Typical features of AVNRT such as typical jump are also associated with a higher efficacy rate. On the other hand, acute failure is associated with a significantly higher recurrence rate, although not all patients with AVNRT still inducible after ablation suffer from recurrences during follow-up. Our study also showed that AVNRT recurrences may occur as late as six years after ablation, that a 2-electrode approach is as safe and effective as a > 2 electrode approach, and that the electrophysiological profile of patients in whom complete SP elimination was achieved may differ from that of patients in whom only SP modification was possible.

Conflict of interest: *none declared*

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Ablacja częstoskurczu nawrotnego węzłowego przedsionkowo-komorowego: czynniki prognostyczne długookresowej skuteczności zabiegu

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Streszczenie

Wstęp: Nawrotny częstoskurcz węzłowy (AVNRT) jest najczęstszą postacią częstoskurczu nadkomorowego i typowym wskazaniem do zabiegu ablacji. Mimo że ablację AVNRT wykonuje się z powodzeniem od ponad 20 lat, czynniki przewidujące skuteczność zabiegu nie są jednoznacznie ustalone.

Cel: Celem pracy była identyfikacja parametrów przewidujących skuteczność ablacji AVNRT.

Metody: Grupa badana składała się z 359 kolejnych chorych z AVNRT (105 mężczyzn, średni wiek 51,1 ± 16,7 roku), u których wykonano ablację prądem o wysokiej częstotliwości, używając typowej techniki elektrofizjologiczno-anatomicznej.

Wyniki: Bezpośrednia skuteczność zabiegu wyniosła 95% u 342 chorych, wśród których u 52% (187 osób) wykonano ablację drogi wolnej (SP), podczas gdy u pozostałych 43% (155 osób) — modyfikację SP. Chorzy z modyfikacją SP byli młodsi, długość cyklu AVNRT była krótsza, mieli rzadziej typowe echo oraz częściej stosowano u nich po ablacji izoproterenol w celu oceny skuteczności zabiegu niż pacjenci z ablacją SP. Wyniki obserwacji odległej uzyskano dla 308 chorych (86% całej grupy poddanej ablacji). W czasie 52,9 ± 27,3 miesięcy (mediana 48, zakres 12–130 miesięcy) nawrót AVNRT wystąpił u 22 chorych (odległa skuteczność 93%). U osób z nawrotem AVNRT rzadziej wykonywano ablację SP niż modyfikację SP (27% *vs.* 56%; p < 0,001) oraz rzadziej stwierdzano typowy skok (vs. bez skoku lub wiele skoków) w badaniu przed ablacją (74% *vs.* 89%, p < 0,06) w porównaniu z pacjentami bez nawrotu arytmii. Analiza wieloczynnikowa wykazała, że obecność typowego skoku podczas badania przed ablacją wiązała się z odległą skutecznością ablacji (HR 5,8; 95% CI 0,44–3,1; p = 0,0089). Nie było istotnych różnic w odległej skuteczności zabiegu między chorymi, u których podczas ablacji użyto 2 elektrod, a pacjentami, u których zastosowano 3 lub 4 elektrody.

Wnioski: Typowy skok i całkowita eliminacja SP są parametrami przepowiadającymi odległą skuteczność ablacji AVNRT. Zastosowanie 2 elektrod jest równie skuteczne i bezpieczne jak użycie większej liczby cewników. Profil elektrofizjologiczny chorych, u których osiągnięto ablację SP, różni się od pacjentów, u których uzyskano modyfikację SP.

Słowa kluczowe: nawrotny częstoskurcz węzłowy, ablacja, skuteczność odległa

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