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ORIGINAL ARTICLE

Success Rate in Patients with Atrioventricular Nodular Re-Entrant Tachycarida (AVNRT) Slow Pathway Catheter Ablation with and without Junctional Rythym

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ABSTRACT
Background and Aim: For successful radiofrequency ablation of atrioventricular nodal reentrant tachycardia (AVNRT), slow-pathway radiofrequency catheter ablation leads to junctional rhythm (JR) is now being considered as a very sensitive substitute end goal. During AVNRT RF ablation, a favorable result could be predicted based on the pattern of JR produced.

Patients and Methods: This cross-sectional study was conducted on 64 patients presenting with symptomatic AVNRT and undergoing slow-pathway RF ablation in the Department of Cardiology, Hayatabad Medical Complex, Peshawar for the duration from January 2022 to June 2022. RF ablation of slow pathway was performed using a combined anatomical and electrogram mapping approach. Ablation was performed by controlling the temperature and delivering energy over 60 seconds at 60°C. In order to determine if the developed JR was successful, isoproterenol infusion was performed after every ablation pulse. Four different patterns of AVNRT inducibility were considered: intermittent, continuous, sparse, and transient. Position, pattern, and number of junctional beats were used to assess the success rate of ablation. SPSS version 28 was used for descriptive statistics.

Results: Of the total patients, there were 36 (56.2%) women and 28 (43.8%) men. The overall mean age was 38.64 ± 18.36 years with an age range 16-80 years. The most prevalent symptom during AVNRT was palpitation found in 41 (64.1%) cases. The prevalence of pre-syncope, dyspnea, and syncope was 3.8%, 3.8%, and 3.4% respectively. The incidence of more than one symptoms were found in 21 (32.8%) patients. Almost all the patients displayed antegrade AH jumps and indicated dual AV nodal conduction. Out of total 156 RF, it took 114 (73.1%) RF energy applications to successfully ablate 38 (59.4%) patients with loss of AVNRT inducibility. About 126 (80.8%) patients developed JR with given specificity 42.6%, sensitivity 89.6%, and negative predictive value 61.8%.

Conclusion: The present study found that the JR predicts the success of AVNRT RF ablation at a high level of sensitivity, but not to a specific degree. However, the findings indicate that its specificity may rise with the appearance of > 14 total tight junctions beats. Furthermore, if the forecast of effective slow-route RF ablation in relation to the existence of JR remains not consistent adequate, its absence might be a trustworthy marker of the pathway needing greater energy application delivery to be abolished.

Keywords: Atrioventricular nodular re-entrant tachycardia (AVNRT), Slow pathway catheter ablation, Junctional rhythm, success rate

INTRODUCTION
Atrioventricular nodal reentrant tachycardia (AVNRT) is the most prevalent supra-ventricular arrhythmia with highest prevalent rates among young female population [1]. Based on numerous clinical trials, radiofrequency (RF) ablation, particularly RF ablation of slow-pathway is now widely accepted as the AVNRT first-line interventional therapy [2-5]. The success rate has been reported to be > 90% with 70% independence from recurrence in last three years and full heart block risk was reported in <1% cases [6, 7]. As of now, the commonest indicator and effective RF ablation end point has been the lack of AVNRT inducibility; nevertheless, it has been observed that it is not immunogenic in up to 10% of individuals [8, 9]. The junctional rhythm (JR) development during this treatment appears to be the accurate with a reported sensitivity of up to 99.5% [10].

Catheter ablation is the preferred treatment choice for symptomatic individuals with AVNRT, however the procedure's goals are yet unknown [11]. Numerous studies reported that the credible endpoint was slow pathway ablation with 1:1 conduction and radiofrequency application as a sensitive marker in successful ablation with junctional ectopy. Induction of a junctional rhythm during RF energy application, on the other hand, is not a particular sign of ablation success, and when rapid, it may imply impending atrioventricular (AV) block. Previous research has revealed that the SP's anatomic position may be related to its electrophysiologic qualities [12, 13]. The duration of the A (H)-A (Md) gap, which expresses the "electrical" distance between the two routes and indicates the danger of AV block after SP ablation, is one of these features [14]. Still, its specificity has been unfavorable, and there is much more to be evaluated in order to resolve the disputes surrounding its specificity in combination with defining the significance of its patterns and effective RF ablation absence [15]. The present study investigated the association between established JR and its features and successful RF ablation of AVNRT.

METHODOLOGY
This cross-sectional study was carried out on 64 patients presenting with symptomatic AVNRT and undergoing slow-pathway RF ablation in the Department of Cardiology, Hayatabad Medical Complex, Peshawar for the duration from January 2022 to June 2022. RF ablation of slow pathway was performed using a combined anatomical and electrogram mapping approach. Ablation was performed by controlling the temperature and delivering energy over 60 seconds at 60°C. In order to determine if the developed JR was successful, isoproterenol infusion was performed after every ablation pulse. Four different patterns of AVNRT inducibility were considered: intermittent, continuous, sparse, and transient. Position, pattern, and number of junctional beats were used to assess the success rate of ablation. The frequency of JR formed during ablation was evaluated in terms of features and its link with effective RF ablation. Gender, underlying illness like dilated cardiomyopathy, ventricular heart disease, hypertension, and concurrent arrhythmias were among the baseline factors. The most common concurrent arrhythmias were atrial fibrillation (AF) and atrial tachycardia (AT).

The JR trend was classified into five distinct groups: 1. Continuous JR, 2. intermittent bursts, 3. Sparse, 4. Transient block, and 5. No junction. SPSS version 28 was used for data analysis. Numerical variables were expressed as mean and standard deviation. Categorical variables were described as frequency and percentages. Chi-square test was used for comparison of categorical variables. All the descriptive statistics was done by taking 95% confidence interval and 5% level of significance.

RESUULTS

Of the total patients, there were 36 (56.2%) women and 28 (43.8%) men. The overall mean age was 38.64 ± 18.36 years with an age range 16-80 years. The most prevalent symptom during AVNRT was palpitation found in 41 (64.1%) cases. The prevalence of pre-syncope, dyspnea, and syncope was 3.8%, 3.8%, and 3.4% respectively. The incidence of more than one symptoms were found in 21 (32.8%) patients. Almost all the patients displayed antegrade AH jumps and indicated dual AV nodal conduction. Out of total 156 RF, it took 114 (73.1%) RF energy applications to successfully ablate 38 (59.4%) patients with loss of AVNRT inducibility. About 126 (80.8%) patients developed JR with given specificity 42.6%, sensitivity 89.6%, and negative predictive value 61.8%. Figure-1 demonstrate the gender's distribution. The prevalence of AVNRT symptoms are shown in Figure-2. Table-I represent the baseline characteristics of initially successful ablation. Successful RF ablation based on junctional rhythm features are shown in Table-II.

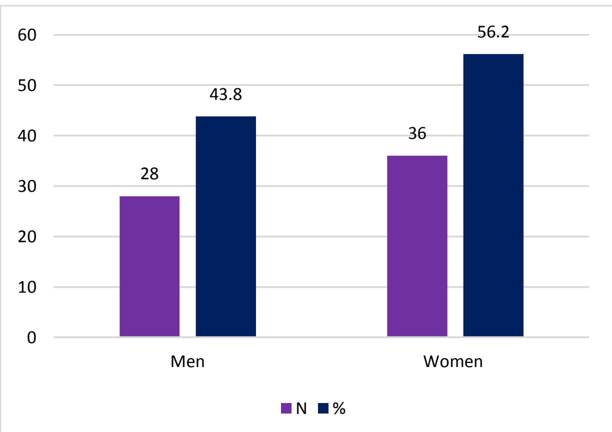

Figure-1: Gender's distribution (n=64)

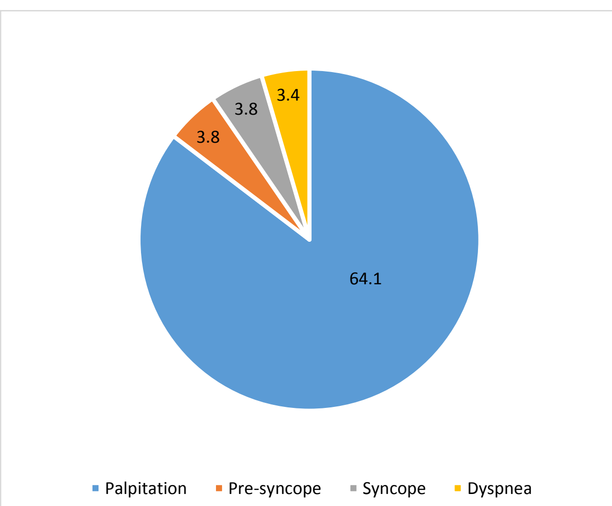

Figure-2: prevalence of AVNRT symptoms

Table-1: Baseline characteristics

Parameters	Successful RF N=38	Unsuccessful RF N=26	P-value
Age (yrs.)	40.24±17.24	37.04±19.48	0.567
Gender N (%)			0.526
Men	18 (47.4)	8 (38.5)	
Women	20 (52.6)	16 (61.5)	
Underlying illness	8 (21.1)	5 (19.2)	0.782
RF total applications	114 (73.1)	42 (26.9)	

Table-2: Successful RF ablation based on junctional rhythm features

Parameters	Successful RF Applications N=114	Unsuccessful RF Applications N=42	P-value
Developed JR positions			0.123
Low poster septal	40 (35.1)	21 (50)	
Mid Septal	41 (36.0)	8 (19)	
High poster septal	31 (27.2)	13 (31)	
Developed JR pattern			
Sparse	40 (35.1)	8 (19)	0.342
Intermittent	30 (26.3)	7 (16.7)	0.100
Continuous	17 (14.9)	3 (7.1)	0.114
Transient block	17 (14.9)	7 (16.7)	0.672

DISCUSSION

The present study mainly focused on slow pathway catheter ablation in patients with atrioventricular nodular re-entrant tachycardia (AVNRT) with and without junctional rhythm and found that the JR predicts AVNRT RF ablation success at a high level of sensitivity, but not to a precise degree. The findings, however, suggest that increase in advent of more than 14 total tight junction beats might increase the specificity. Although JR creation during slow-route RF ablation is not a reliable end point, its lack might indicate that more energy is necessary for the slow pathway ablation. The AVNRT inducibility loss has been thought to be effective slow-pathway RF ablation; nevertheless, AVNRT is not inducible in up to 10% of patients throughout ablation [16, 17]. JR has now been discovered as a sensitive for effective AVNRT ablation during slow-pathway RF ablation. Nonetheless, there are considerable disagreements in the research about its predictive role [18, 19].

In past years, several other investigations have examined the identified JR during RF energy applications and discovered that, while JR evolves substantially more in productive RF ablation by considering the 99.5% sensitivity and <80% specificity and low positive predictive value [20, 21]. Our findings reveal that during AVNRT ablation, JR has a high sensitivity (90.8%) and specificity (41.9%) for effective and consistent with previous literature [22].

More research has been carried out to analyses the aspects of JR that may impact its specificity as an of RF ablation effective predictor. The JR that is primarily formed after RF ablation slow-pathway of AVNRT is hypothesized to be caused by enhanced automaticity of thermally wounded cells [23, 24]. A variety of investigations have shown that behaviors and patterns in certain JR, such as the beginning, quantity, and length of JR beats or even temperatures that elicit JR, have a strong link with effective RF ablation. According to Wells [25], the statistically specific markers of effective ablation include sinus-junction-junction, sinus-junction-sinus, and sinus-junction-block patterns, and the JR pattern that rise and down suddenly during energy administration.

Giaccardi et al, [26] discovered that growing junctional beats > 10 cycle length ratio > 1.26 improve the JR specificity for outcome predicting of slow-pathway ablation. The majority of junctional ectopies formed in our research at the low poster septal location. Nonetheless, there were no substantial variations between the places of JR development and effective RF ablation, which is consistent with the bulk of prior findings.

CONCLUSION

The present study found that the JR predicts the success of AVNRT RF ablation at a high level of sensitivity, but not to a specific degree. However, the findings indicate that its specificity may rise with the appearance of > 14 total tight junctions beats.

Furthermore, if the forecast of effective slow-route RF ablation in relation to the existence of JR remains not consistent adequate, its absence might be a trustworthy marker of the pathway needing greater energy application delivery to be abolished.

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