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Research Article

Wolff-Parkinson-White (WPW) Syndrome Catheter Ablation in Prince Sultan Cardiac Center

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Abstract

Despite being one of the most common causes of supraventricular tachycardia in young adult, there are not many studies that highlight the demographics data as well as procedural characteristics of accessory pathway in Saudi Arabia.

Keywords: wolff-parkinson-white; supraventricular tachycardia

Introduction

Wolff-Parkinson-White (WPW) syndrome is an extra electrical accessory pathway between the heart's chambers without a rapid heart rate. Electrocardiogram of patients with WPW pattern demonstrates a short PR interval and prolonged QRS with a delta wave. Management of such condition is through an electrophysiological intervention called catheter ablation which may permanently correct the underlying heart problem. The aim of this study is to evaluate…

Analysis Methods

Study Design

All patients who were diagnosed with WPW in a single institution in Riyadh, Saudi Arabia from January 2009 to March 2020 were included in this retrospective study. Some of patients were attempted to be treated with catheter ablation but was not done due to Patients' data were obtained by the review of electronic medical records. Data collection included demographic data, type of atrioventricular accessory pathway (AP), location of AP, procedural data, type of ablation and type of tip catheter used.

Indication and Patient Selection

Catheter Ablation Procedure

Statistical Analysis

Continuous variables were reported as mean ± standard deviation or median and 25th to 75th percentile. Categorical variables were presented as counts and percentages. Independent T-test were used to compare the difference between groups for normally distributed variables while Mann-Whitney U test for non-normally distributed variables and Pearson's chi-square test or fisher's exact test for categorical variables as appropriate. Continuous variable distribution was evaluated by Kolmogorov-Smirnov test. A two-sided P-value < 0.05 was considered statistically significant. All analyses were performed using IBM-SPSS version 25 (IBM corp., Armonk, New York).

Two hundred seventeen patients with AP were enrolled from January 2009 till March 2020. Catheter ablation was performed in 207 (95.4%) patients. Successful ablation was achieved in 197 (95.2%) of patients. Median procedure time for all catheter ablation procedure was 110 minutes. Cryoablation [174 (125.13.8) minutes] was significantly longer than radio frequency ablation [110 (76,155minutes)] (p=0.018).

Results

Two hundred seventeen patients with WPW were enrolled in the registry from January 2009 to March 2020. Catheter ablation was performed in 207 (95.4 %) patients. Success ablation was achieved in 197 (95.2 %) of patients. Patients' baseline characteristics and accessory pathway location were summarized in **Table 1.**

Characteristics	Value
Age	28.9 ± 14.3
Children (<18 y)	47 (21.7)
Young adults (18-35 y)	108 (49.8)
Middle adults (36-55 y)	51 (23.5)
Older adults (>55)	11 (5.1)
Male	136 (62.7)
Female	81 (37.3)
Type of accessory pathway	
Manifest pre-excitation	184 (84.8)
Concealed	33 (15.2)
Accessory pathway	
Left	106 (48.8)
Right	111 (51.2)
Location of accessory pathway	
Left anterior/ anterolateral	32 (14.7)
Left lateral	34 (15.7)
Left posterior/ posterolateral	27 (12.4)
Left septal/ posteroseptal	13 (6)
Right lateral / anterolateral / posterolateral	13 (6)
Right posterior	2 (0.9)
Right anterior	5 (2.3)
Right septal / mid septal / anteroseptal posteroseptal	72 (33.2)
Parahisian	19 (8.8)

Table 1: *Baseline characteristics and location of accessory pathway of patients with WPW.*

Characteristics	Value
Successful ablation (n=207)	197 (95.2)
3D Mapping	41 (18.9)
Transeptal	110 (50.7)
Radiofrequency (n=207)	195 (89.9)
Cryoablation (n=207)	12 (5.5)
Irrigated (n=207)	15 (6.9)
Non-irrigated (n=207)	192 (88.5)
Procedure duration, minutes	110 (75, 160)

Table 2: *Procedural data*

Variable	Successful Ablation (n=197)	Failed Ablation (n=10)	p-value
Age	28.4 ± 13.6	32 ± 18.1	0.430
Children (<18 y)	42 (21.3)	3 (30)	0.490
Young adults (18-35 y)	102 (51.8)	3 (30)	
Middle adults (36-55 y)	46 (23.4)	3 (30)	
Older adults (>55)	7 (3.6)	1 (10)	
Male	125 (63.5)	6 (60)	1.000
Female	72 (36.5)	4 (40)	
Manifest	170 (86.3)	7 (70)	0.153
Concealed	27 (13.7)	3 (30)	
Location of AP			
Left anterior/ anterolateral	32 (16.2)	0	<0.001
Left lateral	33 (16.8)	0	
Left posterior/ posterolateral	27 (13.7)	0	
Left septal/ posteroseptal	13 (6.6)	0	
Right lateral / anterolateral / posterolateral	12 (6.1)	1 (10)	
Right posterior	2 (1.0)	0	
Right anterior	4 (2.0)	0	
Right septal / mid septal / anteroseptal posteroseptal	65 (33)	2 (20)	
Parahisian	9 (4.6)	7 (70)	

3D Mapping	37 (18.8)	2 (20)	0.923
Transeptal	108 (54.8)	2 (20)	0.031
Radiofrequency	188 (95.4)	7 (70)	<0.001
Cryoablation	9 (4.6)	3 (30)	
Irrigated	12 (6.1)	3 (30)	0.004
Non-irrigated	185 (93.9)	7 (70)	0.004

Table-3: *Characteristics of patients by outcome of catheter ablation*

Variable	Male (n=136)	Female (n=81)	p-value
Age	28.9 ± 14.1	28.8 ± 14.8	0.940
Children (<18 y)	25 (18.4)	22 (27.2)	0.294
Young adults (18-35 y)	74 (54.4)	34 (42)	
Middle adults (36-55 y)	30 (22.1)	21 (25.9)	
Older adults (>55)	7 (5.1)	4 (4.9)	
Manifest	115 (84.9)	69 (85.2)	0.901
Concealed	21 (15.4)	12 (14.8)	
Accessory pathway			
Left	75 (55.1)	31 (38.3)	0.016
Right	61 (44.9)	50 (61.7)	
Location of AP			
Left anterior/ anterolateral	25 (18.4)	7 (8.6)	0.022
Left lateral	25 (18.4)	9 (11.1)	
Left posterior/ posterolateral	19 (14)	8 (9.9)	
Left septal/ posteroseptal	6 (4.4)	7 (8.6)	
Right lateral / anterolateral / posterolateral	4 (2.9)	9 (11.1)	
Right posterior	2 (1.5)	0	
Right anterior	4 (2.9)	1 (1.2)	
Right septal / mid septal / anteroseptal posteroseptal	28 (27.9)	34 (42)	
Parahisian	13 (9.6)	6 (9.4)	
3D Mapping	28 (20.6)	13 (16	0.409
Transeptal	76 (55.9)	34 (42)	0.047
Successful ablation	125 (95.4)	72 (94.7)	0.825
Radiofrequency	123 (93.9)	72 (94.7)	0.802
Cryoablation	8 (6.1)	4 (5.3)	
Irrigated	9 (6.9)	6 (7.9)	0.784
Non-irrigated	122 (93.1)	70 (92.1)	
Procedure time	112.5 (71.3, 155)	109 (85, 168.5)	0.589

Table 4: *Patients' baseline and procedural characteristics by gender*

Median procedure time for all catheter ablation procedure was 110 (75, 160) minutes. Cryoablation [174 (125.193.8) minutes] was significantly longer than Radiofrequency ablation [110 (76,155 minutes)] (p=0.018) as shown in Figure 1.

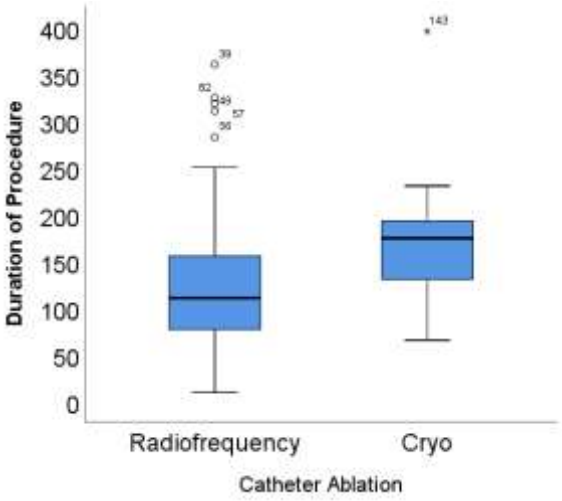

Figure 1: *Box plot of procedure duration for catheter ablation*

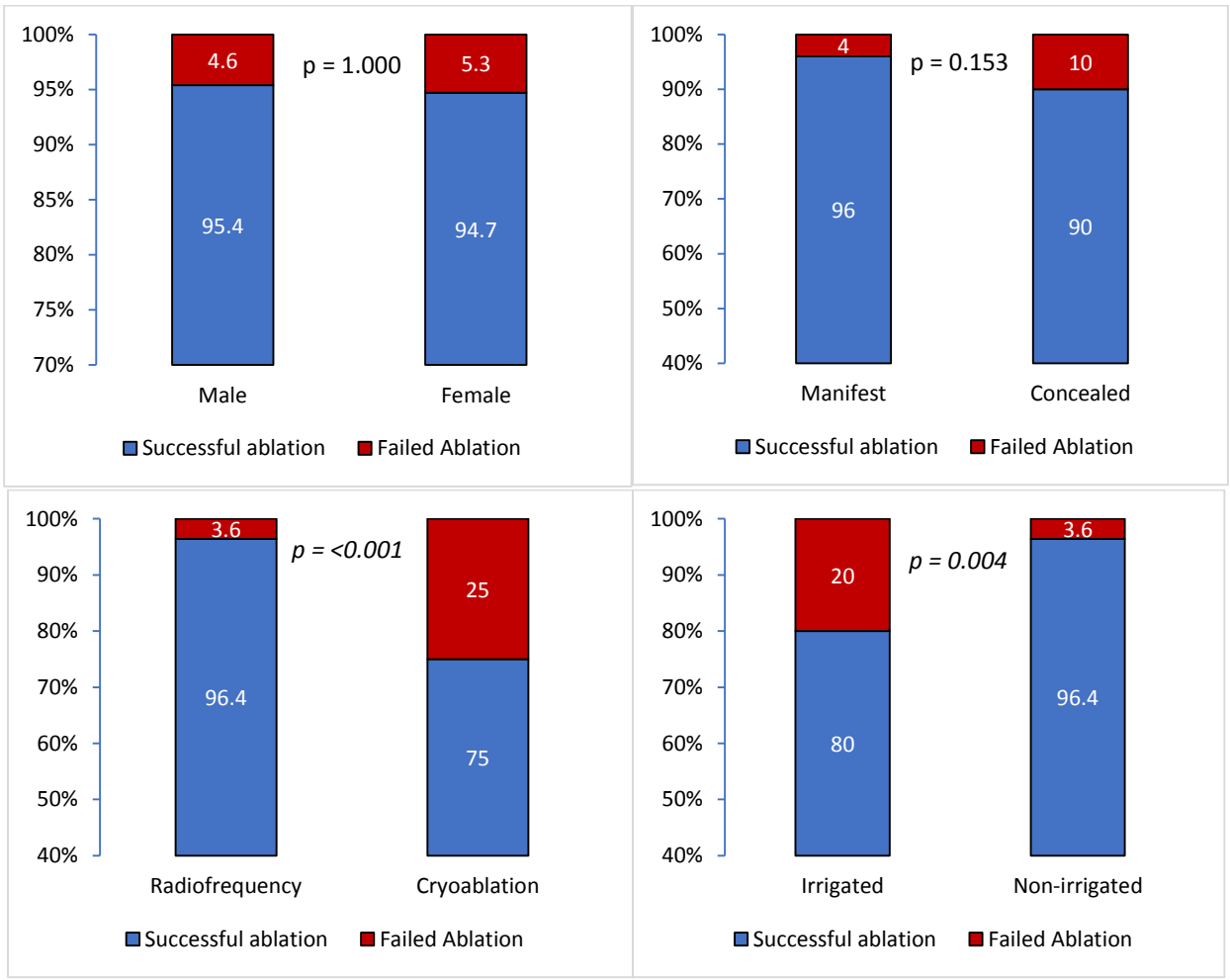

Figure 2: *Percentage of patients' ablation outcomes according to (A) gender (B) type of accessory pathway (C) catheter ablation procedure (D) catheter tip*

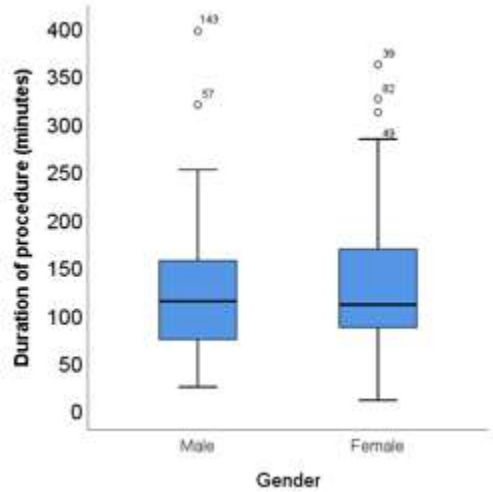

Figure 3:

Conclusion

The patients with the diagnosis of WPW who had received radiofrequency ablation specially irrigated type were associated with a higher success rate compared with those received cryoablation.

The highest percentage of accessory pathway is allocated in Right septal region. High success rate in adults than pediatric patients. Radiofrequency ablation may account for higher success rate in comparison with cryoablation in different situations even procedure duration is less. Therefore, the radiofrequency ablation strategies should be implemented.

Discussion

A large proportion of WPW syndrome patients are asymptomatic so, WPW syndrome is considered as benign disease. [1] In all groups age and male gender were risk factors for recurrence in patients with PSVT. [2]

After proven that catheter ablation of accessory pathway mostly eliminate the risk of sudden cardiac death and restore normal ventricular function in patients with dys-synchrony and impaired left ventricular function prior to ablation. So, considered catheter ablation is the first line in treating of symptomatic WPW syndrome patients [1,8,9]

However Catheter ablation become a standard therapy in patients with symptomatic Wolff–Parkinson–White (WPW) syndrome, It is still questionable in asymptomatic WPW patient should receive ablation or not. In asymptomatic patients with high-risk features international guidelines suggest that catheter ablation of accessory pathway is reasonable including inducible atrioventricular reentrant tachycardia (AVRT), inducible atrial fibrillation (AF) with preexcitation, and the presence of multiple accessory pathways. [6,7] symptomatic and asymptomatic patients were included. All age groups were included, and all patients were collected from a local, nonreferred population. [4,5]

With the great technology development and electrophysiology practice in the last 20 years, there is quantum leap by inventing RF and cryoenergy to ablate near the compact AV node using automated computer system and development of 3-dimentional mapping that map and visualize enhanced substrate which improve Electrophysiologists capability. [10,11]

The main ability of these tools is to increase success rates with ablation, also maximum improvement achieved by decreasing the number of lesions needed for a successful ablation. [23]

In our study, we found that automated signal analysis tools provides satisfying diagnosis accuracy for distinguishing the site of a successful ablation with WPW. These advanced tools available for ablation of WPW may expand and provide an additional equipments and instruments in the EP laboratory. [12]

Patients who underwent cryoablation or who were atrially paced were excluded and all left-sided pathways were approached from a transseptal approach. In this analysis, we included two distinct EP laboratories and numerous different ablation catheters, patients who underwent cryoablation, patients who were atrially paced during ablation, patients with congenital heart disease, and patients who underwent ablation of a left-sided pathway via a retrograde approach [23]

Although good success rates for WPW ablation there is always trend to improve our technical abilities and success rates and minimizing the number of lesions during ablation. Many causes for unsuccessful ablation were demonstrated. patient factors like location of the accessory pathway (near AV node or epicardial location) or operator factors like experience and technical ability, inadequate temperature or power delivery during ablation attempts, poor tissue contact, and or inappropriate analysis of the intracardiac signals. [13,14]

In addition to minimizing the number of unnecessary ablation lesion, one of the benefits is related to the strong predictive ability in the right lateral region of the tricuspid annulus. Demonstration of ablation success rates are low in the right lateral region as low as 85% and a high recurrence rate of up to 16%. [3,13,15,16]

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