Initial Experience in Cardiac Electrophysiological Procedures in Ibn Albitar Cardiac Center

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ABSTRACT

Background: Tachyarrhythmias are often refractory to management with antiarrhythmic drugs, catheter ablation provides effective long-term therapy. Its efficacy and safety is not assessed yet in details in our center.

Objectives: To study the efficacy and safety of cardiac electrophysiological procedures for patients with arrhythmia in Ibn Albitar hospital.

Methods: from February 2016 until November 2018, data from 561 consecutive procedures were analyzed for 545 patients with documented arrhythmias who have been underwent cardiac electrophysiological study with or without radiofrequency catheter ablation in Ibn Albitar Heart Center were included.

Results: Female gender was more predominant (338 patients 62%), mean age was 42.4±14, (range 8-93), 24 (4.4%) patients were above 65 years of age and 21 patients (3.9%) were below 18 years. Ablation was done in 522 (93%) procedures for 510 patients, with overall success rate was (94.7%) with no significant difference between the different age groups (p value=0.14). Atrioventricular nodal reciprocating tachycardia was the most predominant arrhythmias (370 cases 66%), accessory pathway related tachycardia (132 cases 23.5%), atrial tachycardia (24 cases 4.3%), atrial flutter/fibrillation (6 cases 1.1%), ventricular tachycardia / extrasystole (19 cases 3.4%), and (10 cases 1.8% were negative). Procedure-related complications occurred in 13 patients (2.3%), 3 patients (0.5%) had complete heart block requiring permanent pacemaker, 5 patients (0.9%) had transient heart block, 2 patients (0.4%) had pericardial effusion (one of them required pericardial aspiration) and 3 patients (0.5%) had deep venous thrombosis after the procedure.

Conclusions: The radiofrequency catheter ablation is an effective and safe method to manage patients with atrioventricular nodal reciprocating tachycardia, and accessory pathways in different age groups.

Keywords: Supraventricular tachycardia, Radiofrequency Ablation, Atrio ventricular nodal reciprocating tachycardia, Wolf Parkinson White syndrome, Electrophysiology study.

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Tachyarrhythmias are often refractory to management with antiarrhythmic drugs because of inefficacy or intolerable adverse effects. In addition, there is increasing concern that some antiarrhythmic drugs may actually worsen the prognosis of patients with some arrhythmias[1].

Because of the limitations of drug therapy, several catheter ablation techniques have been developed that provide effective long-term arrhythmia control, and improve the quality of life of selected patients with medically refractory arrhythmias[2-4].

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The purpose of this study was to evaluate the efficacy and safety of different types of cardiac electrophysiological (EP) procedures for all patients with arrhythmias who have been undergone this procedure in Ibn Albitar Cardiac Center.

Methods

The EP Cathlab in Ibn Albitar Center was first installed at Feb 2016. All EP procedures (561) from that time until Nov 2018 were collected consecutively.

All patients had documented arrhythmias or with high clinical suspicion of arrhythmias who were poorly controlled or intolerable to medical therapy.

All patients gave written informed consent about the procedure, after full explanation of the procedure and its possible complications to the patient.

The patients were usually admitted to the hospital the same day of the procedure, and usually discharged within 24 hours. The patients usually informed to stop antiarrhythmic medications for more than five half-lives of the drug taken. The procedure was started while the patient in fasting state usually with local anesthesia to the right groin (except in young children were general anesthesia is used), mild sedation was used in selected cases.

Three right femoral venous access were usually used, two quadripolar catheters were used for recording His and Right Ventricle (RV) apex, and one deflectable decapolar catheter for coronary sinus (CS) recording.

In case of atrial flutter a Duodecapolar (Halo) catheter was used to record atrial signals around tricuspid annulus.

The recording system used is EP workmate 4.2.

Basic intervals were measured, standard arrhythmia induction protocol was done with atrial and ventricular extrastimuli and/or burst pacing to determine the arrhythmia mechanism and the possible site of ablation.

Radiofrequency (RF) ablation was used using ibi 16 Generator. Temperature control (50-60 degree) with power (40-50 Jouls), a multicurve deflectable 4mm dry tip ablation catheter is usually used which sometimes switched to irrigated catheter as needed, in flutter cases we used 8 mm tip catheters, in premature ventricular contractions (PVC) we usually used irrigated tip catheters with 3-D mapping system (ENSITE or CARTO).

For left sided ablations either a retrograde aortic approach via a right femoral artery, or a trans-septal approach using SL-0 long sheath and Brockenbrough needle technique.

Acute ablation success was defined based on arrhythmia type as follows: for atrioventricular nodal reciprocating tachycardia (AVNRT): non-inducible arrhythmia, with slow pathway elimination or modification, absence of ECHO beat, and inability of the slow pathway to maintain 1:1 conduction during atrial pacing. Accessory pathway (AP) ablation: absence of antegrade and/or retrograde AP conduction. Atrial tachycardia (AT) and ventricular tachycardia (VT): inability to induce the tachycardia. Atrial flutter: bidirectional isthmus block and for PVC ablation: absence of the target PVC for 30 minutes.

The patients were followed up for 2 to 4 weeks after the procedure and further follow up according to the case.

Categorical variables were expressed as counts and percentages, and continuous variables as means and standard deviations. Data were analyzed using IBM SPSS Statistics 21, and chi square test was used for measuring significance, a p-value less than 0.05 was considered statistically significant.

Results

From 561 EP procedures for 545 patients. Female gender was more predominant (338 patient 62%), (Figure 1). Mean age was 42.4±14, (range 8-93), 24 (4.4%) patients were above 65 years of age and 21 patients (3.9%) were below 18 years.

Ablation was done in 522 (93%) procedures for 510 patients, with the overall success rate was (94.7%) with no significant difference between the different age groups (p value = 0.14), (Table 1).

Complications occurred in 13 patients (2.3%), (Table 2). Three patients (0.5%) had complete heart block (CHB) requiring permanent pace maker, five patients (0.9%) had transient second degree or CHB, two patients (0.4%) had pericardial effusion (one of them required pericardial aspiration) and three patients (0.5%) had deep venous thrombosis (DVT) after the procedure, there

was no significant difference in rate of complications among different age groups, (Table 3).

Types of arrhythmias detected during the procedures are shown in the figure 2, with AVNRT was the most predominant arrhythmias (370 cases 66%), accessory pathway related tachycardia (132 cases 23.5%), atrial tachycardia (24 cases 4.3%), atrial flutter/fibrillation (AF) (6 cases 1.1%), PVC/VT (19 cases 3.4%), and 10 cases 1.8% were negative.

AVNRT was the most common arrhythmia encountered in the procedures 370 procedure (66%), with female were more predominant (70.3%)

Acute success rate was 99.5%. During follow up, 10 patients complained from documented arrhythmias, only three of them (0.8%) ECG shows AVNRT recurrence, while the other seven (1.9%) had other types of arrhythmias (AF, AT).

Complications occurred in eight patients (2.1%), two patients (0.5%) had complete heart block requiring permanent pacemaker, five patients (1.3%) had transient second degree or CHB, and one patient (0.2%) had DVT.

In the current study,132 procedures of accessory pathway related tachycardia was done for 121 patients, 66 (54.5%) cases had manifested AP (WPW), 50 (41.3%) cases had a concealed AP (atrioventricular reciprocating tachycardia AVRT), 3 cases (2.4%) had atypical accessory pathways (Mahaim), and 2 cases (1.5%) had paroxysmal junctional reciprocating tachycardia (PJRT), (Figure 3).

Six patients (4.9%) were not ablated due to patients refusal of high risk ablation due to close proximity of the accessory pathway to the His (Parahisian accessory pathway). The overall acute ablation success rate was (82.8%), with increasing success rate over time, (Figure 4). Recurrence occurred only in one patient (0.8%) after two weeks from successful Mahaim accessory pathway ablation.

Complications occurred in four cases (3%) two of them had DVT, and the other two patients had pericardial effusion one of them necessitating aspiration.

Nineteen procedures (for 16 patients) were done for ventricular arrhythmias, they included:

A- Outflow Tract PVC/VT: 11 procedures (for 9 patients) were done for outflow tract PVCs/VT with overall success rate of (77.7%), using 3D mapping systems.

B- Fascicular VT: 8 patients complained from fascicular VT, all of them had been successfully undergone RF ablation using conventional system, recurrence was encountered in one patient only. Complications was also encountered only in one patient who had complete heart block after ablation of upper septal type of fascicular VT.

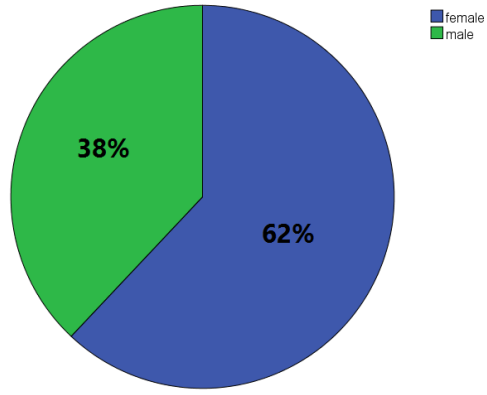


Figure 1: Gender Percentage in the EP Procedures.

Table 1: Successfulness of Ablation Procedures for the patients, with its distribution according to the age groups. P = 0.14, which support a non-significant difference in the successful procedure rates.

	Successful	Unsuccessful	Total
Age	No. (%)	No. (%)	No.
Below 18	18 (90)	2 (10)	20
18-65	442 (94.6)	25 (5.4)	467
Above 65	23 (100)	0	23
Total	483 (94.7)	27 (5.3)	510

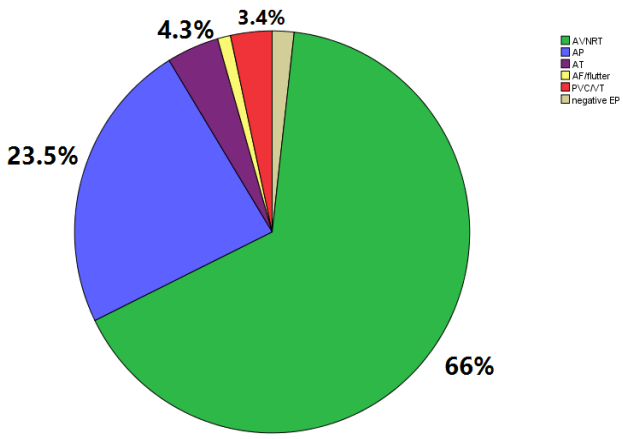
Table 2: Overall complication rate. Red color rows indicate serious complication, orange color indicate severe complication, yellow indicate moderate risk one, and green refers to a non-significant complication.

Complications	No. (%)
CHB requiring PPM	3 (0.5)
Pericardial effusion requiring aspiration	1 (0.2)
Pericardial effusion treated conservatively	1 (0.2)
DVT	3 (0.5)
Transient Heart Block	5 (0.9)
Total	13 (2.3)

CHB: Complete heart block, DVT: Deep venous thrombosis, PPM: Permanent pacemaker.

Table 3. Complication rates according to age groups. P value for difference in complication rates in different age groups was not significant (0.6).

		Complications	
		Number	Percentage
Age	Below 18	0	0
	18-65	12	2.3
	Above 65	1	4.2
Total		13	2.3



Pie chart shows the different types of arrhythmias diagnosed during the EP procedures, with AVNRT (66%), accessory pathway (23.5%), atrial tachycardia (4.3%), atrial flutter or fibrillation (1.1%), ventricular tachycardia or frequent ventricular extrasystole (3.4%), and negative EP study in (1.8%).

Figure 2: Percentages of types of arrhythmias detected during the EP procedures.

Table 4: Complications encountered during AVNRT Ablations.

Complications	Number (percentages)
Overall complications	8 (2.1)
Complete heart block	2 (0.5)
2nd degree/transient heart block	5 (1.3)
Vascular complications	1 (0.2)

Pie chart shows the percentages of the four different types of accessory pathways encountered, manifested pathway (WPW) (54.5%), concealed pathway (AVRT) (41.3%), atypical pathway (Mahaim) (2.5%), and paroxysmal junctional reciprocating tachycardia (PJRT) in (1.7%).

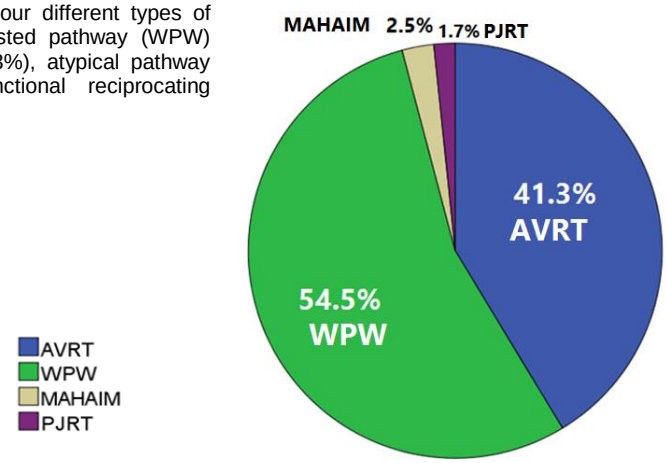
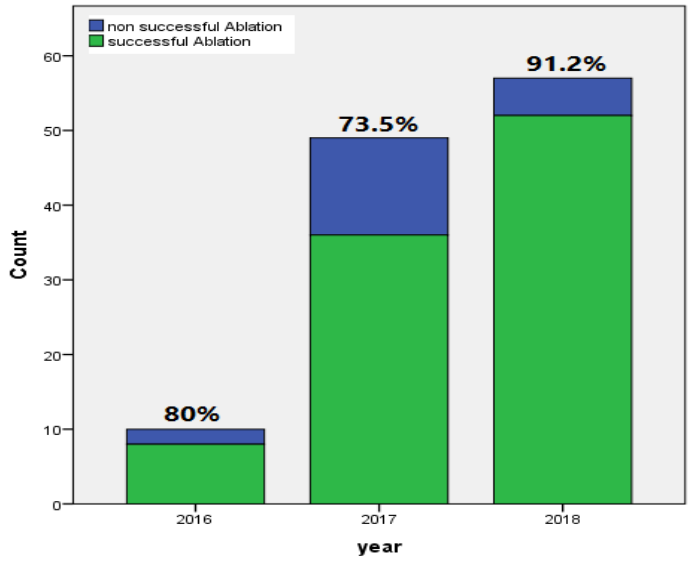


Figure 3: Percentages of types of accessory pathways encountered during the EP procedures.



Bar chart shows the progressive increase in number and successfulness of EP ablation procedures for 116 patients over years, in 2016 (8 out of 10 (80%), in 2017 (36 out of 49(73.5%), and in 2018 (52 out of 57(91.2%) had successful EP ablation procedures, respectively.

Figure 4: Percentages of successful EP procedures over years.

Discussion

The current study represents the initial experience in RFA in our center with overall success rate and complication rate is similar to that seen in other studies[5].

We included patients from different age groups where 21 patients were below 18 years old and 24 patients were above the age of 65, with success rate of 90% and 100% respectively. There was no significant difference in the success rate of RF ablation among different age groups, as seen in other studies performed by Tanel et al with 90%[6], Seixo et al with 94.1%[7] overall success rate in the pediatric age group , and with J Kihel et al (100%), and Hoffmann BA, et al (98.5%) in elderly patients[8,9].

There was no significant difference in the overall complication rate among different age groups, which was comparable to that seen in other studies (same above).

The current study showed that AVNRT was the most common cause of Supraventricular tachycardia (SVT) followed by Accessory pathway mediated tachycardia

The acute success rate of slow pathway ablation in AVNRT was 99.5% which is comparable to other studies[5,6,8,10,11].

The documented recurrence rate (0.8%) was lower than that reported in most published studies (2-6%)[12-15], this is probably due to our approach of achieving a hard end point of complete slow pathway elimination whenever possible, or at least accepting a very short slow pathway zone. Missing some patients during follow up may also contribute to this low recurrence rate.

Complication rate occurred in AVNRT in (2.1%), and CHB requiring PPM occurred in only two patients (0.5%) who were within the first 40 procedures for AVNRT ablation (early learning curve), these results are comparable to other studies which showed a CHB rate of less than 1%[5,9,12].

The overall success rate of accessory pathway ablation (82.8%) is slightly lower than the current success rate in published trials (89-98%)[5,16,17]. This can be attributed to the initial lack of some essential equipment like steerable sheaths, trans-septal sheaths, and 3D mapping system. With the building of experience with time and the use of different approaches like trans-septal approach for left sided accessory pathways, the success rate increased to 91.2% in the last year as shown in the figure.

Complications were encountered in 3% of the procedures, which are similar to other studies (2%)[5,17].

The low number of outflow tract PVC/VT ablation cases is due to the limited availability of 3D mapping system materials, we successfully ablated seven out of nine patients, one of the failed procedures was suspected to be epicardial, and the other one needed an irrigated catheter which was unavailable at that time.

All patients with fascicular VT were ablated successfully, and one patient had early recurrence after ablation, of note he had non inducible VT during the procedure.

One patient had complete heart block after ablating upper septal fascicular VT, which is a rare type of fascicular VT, with high risk of CHB[18], and the patient and his family accepted this risk due to intolerable recurrent episodes of VT.

In conclusion; The results of this single-centre study, which included patients with a wide age range, showed results comparable to those of previous studies. Our results confirm that RFA is safe and effective, supporting ablation therapy as a first-line therapy for the majority of patients.

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