

2-2021

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Waleed Khan

Behzad Pavri

John Schanz

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CRYO VS RF P-WAVE CHARACTERISTICS COMPARATIVE ANALYSIS

Waleed Khan, John Schanz*, Dr. Behzad Pavri**

INTRODUCTION

- Atrial fibrillation (AF) is a common type of arrhythmia, occurring in 1-2% of the population, with that number promising to increase with our aging population.¹
- Treatment centers on control of heart rate, restoring sinus rhythm, and anticoagulants.
- Catheter ablation may be used in patients whose AF is drug-refractory. This procedure is called a pulmonary vein isolation (PVI)
- The two PVI options are cryoballoon ablation and radiofrequency (RF) ablation
- Previous studies show them having similar efficacies in terms of AF recurrence 30 months after the procedure.³

RESEARCH QUESTION & HYPOTHESIS

- Certain p-wave parameters (p-wave dispersion, p-wave duration, and p-wave terminal force) when measured from a surface ECG have been found to be helpful in predicting the probability of recurrence of AF post ablation.⁴
- Previous studies have also compared the recurrence rates of cryoballoon and RF ablation, but this has not been in conjunction with review of the p-wave parameters
- **Research Question:** Will there be a statistically significant difference in p-wave amplitude between RF ablation and cryoballoon ablation?
- **Research hypothesis:** We expect there to be statistically significant differences in the post ablation p-wave amplitude between the two techniques.
- This study will attempt to highlight the differences if they are present and make inferences about whether a patient would benefit from one technique over the other using surface ECG p-wave characteristics, ECG derived vector loops, and 3D cardiac mapping studies.

METHODS

- This study will require a retrospective chart review with ECG analysis of approximately 130 patients who fulfill the following criteria:
- 1. Have drug-refractory paroxysmal or persistent AF who have received treatment through either cryo-balloon or RF ablation within the last two years
- 2. Have 12 lead ECGs available with one taken within 3 month prior to ablation treatment and one taken 3 months after
- ECGs will be acquired from EPIC and MUSE
- A 2 tailed t-test will be used to determine the significance of parameters in determining recurrence rates

BASELINE CHARACTERISTICS

Baseline characteristics to be collected:

- Age
- Sex
- Previous anti-arrhythmic drug regimen
- Diabetes and hypertension status
- LVEF
- CHA₂DS₂-VASc score

ECG VARIABLES

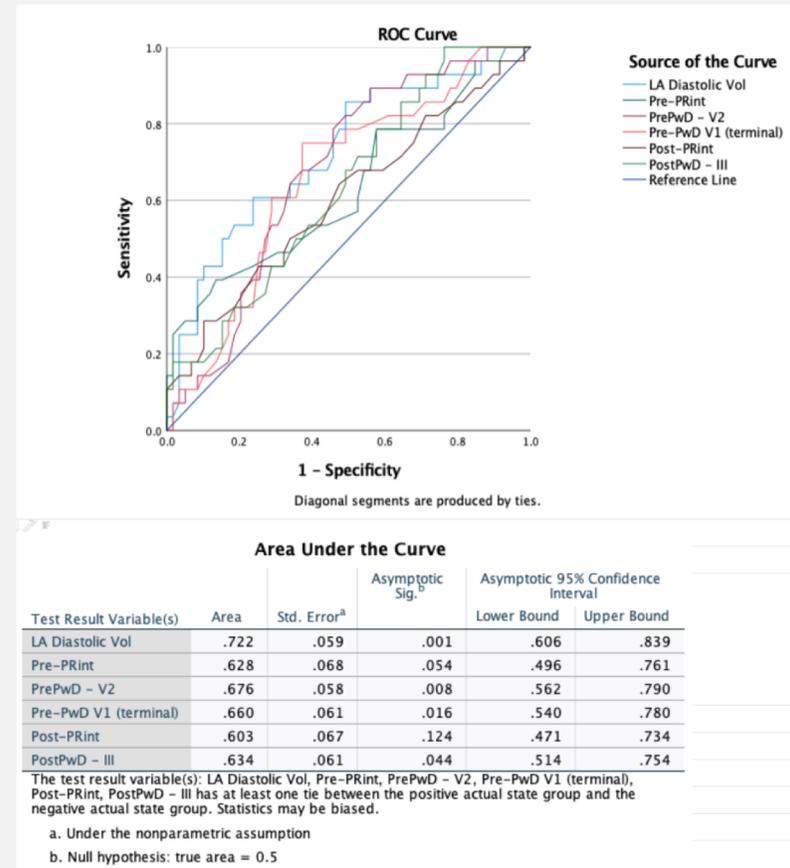
These p-wave parameters have been found in previous studies to be useful in predicting AF recurrence probability:

- p-wave duration
- p-wave duration dispersion
- p-wave terminal force
- Frontal p-wave axis

p-wave amplitude is the variable we are most focused on in this study as its relation to recurrence rate determination is unknown

RESULTS

- At this point in time, all data collection has been completed
- LA diastolic volume, pre-PR interval, pre-PwD V2, pre-PwD V1, post-PR interval, and post-PwD III were found to be linked to recurrence rates
- Putting this all together suggests that larger left atriums require more time for electrical signals to be transmitted and both groups of parameters are linked to AF recurrence



RESULTS

- Upon separating the data between Cryo and Rf patients, the previously mentioned parameters were still significant in determining recurrence rates, with some differences in the strength of the correlations
- It is these differences where we will focus our attention, but it is encouraging to see our findings match up and make logical sense
- We were also fortunate to be able to approximately double the amount of patients we could collect data from and the expanded data helped clear up some inconsistencies in our data

RESULTS

- We were also able to combine the factors into an equation to predict recurrence

$$\text{Prob}(\text{recurr}) = \frac{e^{(-6.875 + 0.22 \cdot \text{LA diastolic vol} + 0.004 \cdot \text{Pre-PRint} + 0.005 \cdot \text{PrePwD-V2} + 0.019 \cdot \text{Pre-PwD-V1}(\text{term}) - 0.000077 \cdot \text{Post-PRint} + 0.003 \cdot \text{PostPwD-III})}}{1 + e^{(-6.875 + 0.22 \cdot \text{LA diastolic vol} + 0.004 \cdot \text{Pre-PRint} + 0.005 \cdot \text{PrePwD-V2} + 0.019 \cdot \text{Pre-PwD-V1}(\text{term}) - 0.000077 \cdot \text{Post-PRint} + 0.003 \cdot \text{PostPwD-III})}}$$

Classification Table^a

Observed		Predicted		Percentage Correct
		Recurrence 0	1	
Step 1	Recurrence 0	55	4	93.2
	1	18	10	35.7
Overall Percentage				74.7

CONCLUSIONS

- At this point in time we have been able to isolate LA diastolic volume, pre-PR interval, pre-PwDV2, pre-PwDVI, post-PR interval, and post-PwD III, as p-wave parameters helpful in predicting recurrence rates
- Previous studies have found p-wave duration, p-wave dispersion, and p-wave terminal force to be clinically significant markers for predicting AF recurrence.³
- Our findings at this point will be helpful in predicting recurrence with the parameters and the equation we created, although these both need more work to increase sensitivity
- Looking forward we still need to fulfill our initial objective of comparing the efficacies of Cryo and RF ablation, but the findings we have had so far have been promising and beneficial in their own right

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