The Role of P wave Duration in Prediction of Atrial Fibrillation after Cardiac Surgery

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Abstract

Background- Atrial arrhythmias occur frequently after cardiac surgery, and atrial fibrillation (AF) was the most common atrial arrhythmia after cardiac surgery. It occurs in up to 40% of patients primarily within 2 to 3 days, and it can compromise systemic hemodynamics and increase the risk of embolization. Some clinical issues can predict the risk of atrial fibrillation, like P wave duration. The aim of this study is to evaluate the role of P wave duration in prediction of post cardiac surgery AF.

Methods- We measured P wave duration in 206 cardiac surgery patients the day before surgery and followed the patients for 3 days to find the possible relation between P wave duration and the risk of AF after surgery.

Results- Our study showed the prevalence of AF after cardiac surgery was about 9% and there was no relation between P wave duration before surgery and risk of AF after surgery.

Conclusion- The risk of AF in our patients was less than other studies, and this study showed we can not use P wave duration in surface ECG as a predictor of post-cardiac surgery AF ***(Iranian Heart Journal 2006; 7 (4): 49-51)***.

Key words: atrial fibrillation ■ cardiac surgery ■ P wave

Atrial fibrillation (AF) is the most common sustained arrhythmia in the general population with about 1% prevalence and 0.1-0.2% annual incidence.[1]

The frequency of AF increases markedly with age, and in octogenarians the annual prevalence and incidence of AF are reported to be greater than 6 and 2%, respectively.[2]

AF is one of the most frequent complications of cardiac surgery. It occurs in up to 40% of patients, primarily within 2 to 3 days.[3]

In the early postoperative period, rapid ventricular rates and loss of atrial transport may compromise systemic hemodynamics, increase the risk of embolization, and lead to a significant increase in duration of hospital stay and a two to three-fold increase in postoperative stroke.[4]

Clinical issues that convey higher risk for the development of postoperative AF are advanced age, mitral stenosis, increased LA size, long bypass time, pericarditis, RCA grafting, COPD, etc.

Among all the above risk factors, P wave duration is a new marker in predicting post-operative AF, which has been evaluated in this study.[4,5]

Methods

Patients: The study group comprised 206 consecutive patients (154 male, 52 female)

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undergoing cardiac surgery (coronary artery surgery, cardiac valve surgery or congenital disease surgery).

Methods

Patients were classified according to the type of their cardiac surgery. All of the patients had normal sinus rhythm before cardiac surgery.
12-lead surface electrocardiogram (ECG) was done for all of the patients the night before surgery, and the P-wave duration was calculated at D II. Patients were followed and evaluated up to 3 days after cardiac surgery. They were on close monitoring for any cardiac dysrrhythmias, especially atrial fibrillation.

Statistical analysis: The study data was analysed with SPSS software and evaluated with T test and chi-square test and variance analysis.

Results

74.8% of the patients were male and 25.2% were female. Mean age of study group was 54.60 years (12.99 SD). Minimum age of patients was 13 years and maximum age was 76 years.

Table I. Age distribution of patients

		Statistic	Std.Error
Age	Mean	54.6078	1.2867
	95% Confidence Interval for Mean Lower Bound	52.0553	
	95% Confidence Interval for Mean Upper Bound	57.1603	
	5% Trimmed Mean	55.5904	
	Median	58.0000	
	Variance	168.874	
	Std. Deviation	12.9952	
	Minimum	13.00	
	Maximum	76.0	
	Range	63.00	
	Interquartile Range	15.2500	
	Skewness	-1.213	.239
	Kurtosis	1.671	.474

Patients were classified according to their diagnosis before cardiac surgery. Most of the patients had coronary artery disease (CAD) and coronary artery surgery.

Table II. Diagnosis Before Surgery

		Frequency	%	Valid %	Cumulative%
Valid	CAD	176	85.4	85.4	85.4
	ASD	12	5.8	5.8	91.3
	MR	4	1.9	1.9	93.2
	AS/AI	4	1.9	1.9	95.1
	AS	2	1.0	1.0	96.1
	CAD/MR/MS	2	1.0	1.0	97.1
	CAD/AI	2	1.0	1.0	98.1
	AR/MR	4	1.9	1.9	99.0
	Total	206	100.0	100.0	

65 percent of patients had off-pump cardiac surgery and 35 percent had on-pump (with cardiopulmonary bypass, CPB) surgery, all non-coronary surgeries were performed with CPB and mean pump time was 77 minutes.
The study showed that 39.8% of patients had no rhythm disturbances in the first 3 days after cardiac surgery, but 60.2% of patients experienced some transient or persistent rhythm disturbances (PAC, PVC, AF, VT, PSVT, junctional rhythm, atrial tachycardia). The most common dysrhythmia was paroxysmal ventricular complexes (28.2%).
Atrial fibrillation was seen in 18 (8.7%) of our patients (transient or persistent).

Table III. Rhythm after surgery

		Frequency	Percent	Valid Percent
Valid	Sinus	82	39.8	39.8
	AF	18	8.7	8.7
	Others	106	51.5	51.5
	Total	206	100	100

Duration of P wave in the study group was between 0.04 to 0.12 s (mean 0.0789 sec).

Table IV. Descriptives of P wave duration

		Statistic	Std.Error
P Time	Mean	.0789	1.701E-03
	95% Confidence Interval for Mean Lower Bound	.0756	
	Upper Bound	.0823	
	5% Trimmed Mean	.0790	
	Median	.0800	
	Variance	.000	
	Std. Deviation	.0173	
	Minimum	.04	
	Maximum	.12	
	Range	.08	
	Interquartile Range	.0200	.238
	Skewness	.005	.472
	Kurtosis	.338	

Duration of P wave in the study group was from 0.04 to 0.12s (mean 0.0789s) compared to 0.08 sec in the sinus rhythm group, which showed no meaningful difference between the two groups.

Table V. Mean P wave duration according to post-surgery rhythm.

	N	Mean	SD	St. Error	95% confidence interval for mean		Min.	Max.
					Lower Bound	Upper Bound		
Sinus	82	8.E-02	.0192	3.E-03	7.E-02	8.5E-02	.04	.12
AF	18	7.E-02	.0156	5.E-03	6.E-02	8.4E-02	.06	.10
Other	106	8.E-02	.0156	3.E-03	7.E-02	8.7E-02	.04	.10
Total	206	8.E-02	0.171	3.E-03	7.E-02	8.2E-02	.04	.12

There was no significant difference between P wave duration according to age and sex.
Most patients with post-surgical AF had undergone off-pump coronary artery surgery.
The mean age of the AF group was 60 years, which was higher than in the no arrhythmia patients, and other arrhythmias.

Discussion

In the present study, we reported that atrial fibrillation was one of the most common arrhythmias after cardiac surgery, but the prevalence of this arrhythmia was just 8.7% at 3 days after cardiac surgery in our study, which was less than that reported in previous studies (8.7% vs. 36-40% in some previous studies).[6]
The most common arrhythmia after cardiac surgery was ventricular premature beats.

According to previous studies (Aranki SF, et al, 1996; Buxton AE, et al, 1981; Guindera et al, 1993), P wave duration can be used as a predictor of atrial fibrillation after cardiac surgery, but our study showed no close relation between P wave duration and possibility of AF after cardiac surgery.[4,7,8]

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