

Special Article

Spontaneous Conversion to Sinus Rhythm of Recent (Within 24 hours) Atrial Fibrillation

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Abstract

Objectives. The purpose of the study was to determine the likelihood of spontaneous conversion of recent onset (< 24 hr) paroxysmal atrial fibrillation (Af) to sinus rhythm and to define clinical and echocardiographic characteristics which may predict it.

Methods. One hundred fifty-three consecutive adult patients admitted to the hospital with recent onset Af (< 24 hr) were studied. In each patient history, complete physical examination, 12-lead electrocardiogram, chest X-ray, routine hematological studies, serum electrolytes, troponin, thyroid function studies and a complete echocardiographic evaluation were performed. Patients hemodynamically unstable, with recent myocardial infarction, unstable angina, average ventricular rate > 150 beats/min, hyperthyroidism, congestive heart failure, left ventricular hypertrophy, valvular heart disease, and on antiarrhythmic drugs at the time of admission, were excluded. Patients were monitored without antiarrhythmic therapy for at least 24 hr from the onset of Af.

Results. Spontaneous conversion to sinus rhythm occurred in 109 patients (71.2%), among patients with spontaneous conversion 73.4% converted in the first 12 hr. Age, gender, other clinical characteristics, left ventricular dimensions and performance did not separate patients with or without spontaneous conversion. Left atrial size was significantly greater in patients without compared to patients with spontaneous conversion ($p < 0.03$), likewise increased left atrial size (> 40 mm) was seen more often in patients without compared to patients with spontaneous conversion (45% vs 22%, $p < 0.05$).

Conclusions. Spontaneous conversion to sinus rhythm occurred in 71% of patients with recent onset (< 24 hr) Af. Left atrial size was the only predictor of spontaneous conversion in this highly selected group of patients.

J Cardiol 2001; 37(2): 103 - 107

Key Words

Atrial fibrillation (paroxysmal)

Echocardiography, transthoracic

Arrhythmias (spontaneous conversion)

INTRODUCTION

Paroxysmal atrial fibrillation (Af) is a common cardiac arrhythmia often associated with underlying cardiovascular disease and its incidence increases

with age¹). Data from previous studies have suggested that paroxysmal Af often is converted spontaneously to sinus rhythm^{2,3}). Factors which may predict spontaneous conversion of paroxysmal Af to sinus rhythm have not been well defined³⁻⁵).

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Received for publication November 6, 2000

Antiarrhythmic therapy for acute conversion of paroxysmal Af to sinus rhythm often is not effective; furthermore acute loading with antiarrhythmic drugs for the conversion of paroxysmal Af often is not free of adverse effects^{6,7}. Thus, the identification of patients with high likelihood of spontaneous conversion to sinus rhythm is of great clinical significance.

The present study was undertaken to determine the likelihood of spontaneous conversion of recent onset (< 24 hr) paroxysmal Af to sinus rhythm and to define clinical and echocardiographic characteristics which may predict conversion.

METHODS

One hundred fifty-three consecutive adult patients, admitted to the Hospital from September 1998 to November 1999 with recent onset of Af (< 24 hr), were studied. After a history each patient had complete physical examination, 12-lead electrocardiogram, chest X-ray, routine hematological studies, serum electrolytes, creatinine, creatine phosphate and MB isoenzyme, troponin, free thyroxine (FT₄), thyroid stimulating hormone (TSH), and a complete echocardiographic evaluation. Patients were admitted in a monitor unit where continuous monitoring of cardiac rhythm was performed; blood pressure was measured every two hr using standard mercury sphygmomanometer. The time of onset of Af was defined with abrupt and clear recognizable onset of symptoms such as palpitations, chest discomfort, dyspnea and dizziness alone or in combination. Patients with Af of uncertain onset or duration > 24 hr, hemodynamically unstable, recent myocardial infarction, unstable angina, average ventricular rate > 150 beats/min, hyperthyroidism, congestive heart failure, left ventricular hypertrophy, valvular heart disease and on therapy with antiarrhythmic drugs at the time of admission were excluded from the study. Age, gender, history of arterial hypertension, diabetes mellitus, coronary artery disease, previous myocardial infarction, heavy alcohol consumption in the past or prior to admission and a history of previous Af were included for further analysis. Therapy with pharmacological agents other than antiarrhythmics such as beta-receptor antagonists, calcium channels blocking agents, or digoxin were also included.

M-mode and two-dimensional echocardiography was performed on each patient during the hospital stay using Acuson 128 XP. Patients were examined

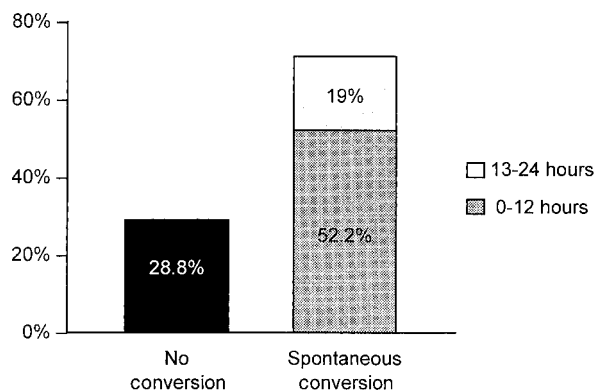


Fig. 1 Incidence of spontaneous conversion to sinus rhythm within 24 hours

by the same investigator, in the left lateral recumbent position after a 15-min rest period. A 2.5 MHz transducer was used for two-dimension and M-mode registrations from parasternal and apical windows. M-mode echocardiography measurements were obtained according to the recommendations of the American Society of Echocardiography⁸ using average values of five consecutive cardiac cycles. Left atrial and ventricular diameters were measured by two-dimensional directed M-mode echocardiography and M-mode tracings were recorded at a paper speed 50 mm/sec. Fractional shortening of left ventricular wall was calculated as (end-diastolic - end-systolic diameter / end-diastolic diameter) × 100.

Statistical analysis

The two-tailed Student's *t*-test was used to compare continuous variables and the χ^2 -test to compare the distribution of categorical variables. To define which factors were contributed independently to conversion to sinus rhythm stepwise logistic regression analysis was performed. Results are expressed as mean ± standard deviation (SD). *P* values less than 0.05 were considered statistically significant.

RESULTS

Eighty-two of the patients were male (54%) and 71 were female. Spontaneous conversion to sinus rhythm occurred in 109 of the patients (71.2%; **Fig. 1**). Among patients with spontaneous conversion 80 (73.4%) converted in the first 12 hr from the onset of Af and the remainder 29 between 12 and 24 hr from the onset of Af. Age (65 ± 9 vs 64.9 ±

Table 1 Clinical and echocardiographic characteristics in patients with and without spontaneous conversion to sinus rhythm

| | Spontaneous conversion (n = 109) | No spontaneous conversion (n = 44) | p value |
|---|-------------------------------------|---------------------------------------|---------|
| Male | 55 (50.5%) | 27 (61.5%) | 0.29 |
| Arterial hypertension | 70 (64.2%) | 22 (50.0%) | 0.1 |
| Coronary artery disease | 13 (11.9%) | 7 (15.9%) | 0.5 |
| Chronic pulmonary disease | 5 (4.6%) | 1 (2.3%) | 0.5 |
| Pericarditis(acute) | 2 (1.8%) | 0 | 0.4 |
| Alcohol consumption(chronic or acute) | 1 (0.9%) | 2 (4.5%) | 0.1 |
| Smoking | 13 (11.9%) | 7 (15.9%) | 0.5 |
| Diabetes mellitus | 20 (18.3%) | 7 (15.9%) | 0.7 |
| History of Af | 66 (60.6%) | 23 (52.3%) | 0.3 |
| Beta-blockers | 29 (26.6%) | 11 (25.0%) | 0.8 |
| Calcium channel blockers | 22 (20.2%) | 10 (22.7%) | 0.7 |
| Digoxin | 15 (13.8%) | 4 (9.1%) | 0.4 |
| Left atrial dimension > 40 mm | 21 (22.3%) | 17 (44.7%) | 0.018 |

Data are presented as number(%)of patient group(²).
Af = atrial fibrillation.

Table 2 Echocardiographic characteristics in patients with and without spontaneous conversion to sinus rhythm

| | Spontaneous conversion (n = 109) | No spontaneous conversion (n = 44) | p value |
|--|-------------------------------------|---------------------------------------|---------|
| Left atrial dimension(mm, n.l. < 40) | 37.1 ± 5.2 | 39.2 ± 5.8 | 0.03 |
| LVDd(mm, n.l. < 56) | 50.1 ± 6.4 | 51.5 ± 6 | 0.18 |
| LVDs(mm, n.l. < 39) | 33.8 ± 6.8 | 34.1 ± 6.5 | 0.7 |
| % D(n.l. > 30%) | 34 ± 4 | 33 ± 4 | 0.5 |

Data are represented as mean ± SD(*t*-test)

n.l. = normal limits ; LVDd = left ventricular diastolic dimension ; LVDs = left ventricular systolic dimension ;
% D = fractional shortening of left ventricular internal diameters.

10 years), gender and other clinical characteristics did not separate patients with compared to those without spontaneous conversion(**Table 1**). Likewise the prior use of digoxin, beta-blockers, or calcium channel blockers at the time of presentation did not separate patients with compared to those without spontaneous conversion(**Tables 1, 2**).

Left atrial dimension was significantly greater in patients without compared to patients with spontaneous conversion($p < 0.03$). Increased left atrial dimension > 40mm was more frequent in patients without spontaneous(45%)compared to patients with spontaneous conversion(22%), $p < 0.02$ (**Table 1**) Left ventricular dimensions and performance were not statistically different between the

two groups.

DISCUSSION

The present study demonstrated that spontaneous conversion to sinus rhythm in patients with paroxysmal Af and duration < 24 hr, is high(71.2%). Only left atrial dimension could separate patients who would probably have spontaneous from those without spontaneous conversion. Other clinical and echocardiographic variables such as age, gender, hypertension, coronary artery disease, chronic pulmonary disease, history of pericarditis, diabetes mellitus, chronic alcohol consumption, smoking, history of prior Af, left ventricular size, or left ventricular function did not separate patients with compared to those without spontaneous conversion.

Previous studies on a small number of patients have examined the effect of pharmacological agents which slow the atrioventricular node conduction, such as digitalis, diltiazem, verapamil and beta-blockers, in patients with Af. It was concluded that these agents are effective only in controlling ventricular rate but not in converting Af to sinus rhythm⁹⁻¹¹).

Recently the Digitalis in Acute Atrial Fibrillation (DAAF) Trial Group examined the effect of digoxin given intravenously in the rate of conversion of Af to sinus rhythm in 239 patients with Af of less than 7 days duration. In that multicenter, prospective, blind, randomized study, 46% of the placebo group and 51% of the digitalis group were converted to sinus rhythm at 16 hr; this mild difference was not statistically significant¹²). Similar results were obtained from other studies in a smaller number of patients^{2,13,14}).

Other studies evaluated the effect of amiodarone or propafenone in patients with Af. Galve *et al.*⁵) examined the effect of intravenous amiodarone (5 mg/kg within 30 min, following 1,200 mg intravenous infusion over 24-hr period) in 100 consecutive patients with recent onset (< 1 week) Af. Conversion to sinus rhythm within 24 hr occurred in 68% of patients treated with amiodarone and 60% of patients treated with placebo ($p = NS$). They also found that smaller left atrial size was a predictor of spontaneous conversion to sinus rhythm. Gotter *et al.*⁴) found that amiodarone 125 mg per hr intravenously for 24 hr resulted in conversion of paroxysmal Af to sinus rhythm in 92% of the patients; this rate of conversion was significantly greater compared to placebo (65%), $p < 0.002$.

Azpitarre *et al.*¹⁵) in a double blind randomized study evaluated the effect of propafenone 450 - 750 mg in a single oral dose (29 cases) or placebo (26 cases) in patients with less than 1 week onset of Af. The rate of 24-hr conversion was not significantly different in propafenone compared to placebo group, but significantly larger number of patients converted to sinus rhythm in 2, 6 and 12 hr after initiation of treatment. Boriani *et al.*¹⁶) investigated the effect of oral propafenone in 240 hospitalized patients with recent onset Af (< 7 days). They found that oral loading of propafenone was more effective than placebo in converting Af to sinus rhythm at 3 and 8 hr, mainly in patients without underlying structural heart disease.

The rate of spontaneous conversion in previous studies^{4,5,15,16}) in the placebo groups was less compared to our study, but the duration of Af in these studies usually was longer than 24 hr compared to our study which was less than 24 hr. In addition in our study patients with left ventricular hypertrophy, congestive heart failure, valvular heart disease and hyperthyroidism were excluded, and thus patient population in one study was homogeneous.

In this homogenous group of patients, the data have showed that the incidence of conversion of recent onset Af (< 24 hr) to sinus rhythm is high. Furthermore, among patients with spontaneous conversion, 73.4% were converted in the first 12 hr from the onset of Af. These data are in agreement with that reported by Wijffels *et al.*¹⁷) in an experimental goat model where spontaneous conversion to sinus rhythm was unlikely if the duration of experimentally induced Af was greater than two weeks. In contrast, experimentally induced Af of short duration was spontaneously converted to sinus rhythm.

Based on these data it is suggested that hemodynamically stable patients without underlying heart disease and with recent onset paroxysmal Af, can be followed for at least 24 hr without antiarrhythmic therapy, since spontaneous conversion to sinus rhythm is very high. After spontaneous conversion to sinus rhythm long term antiarrhythmic therapy should be individualized.

CONCLUSIONS

Spontaneous conversion to sinus rhythm occurs in 71% of patients with recent onset (< 24 hr) Af. Left atrial size is the only predictor of spontaneous conversion to sinus rhythm in this highly selected group of patients without underlying cardiac or other disease process predisposing to atrial fibrillation. The high rate of spontaneous conversion in these patients highlights the importance of identifying the duration of onset of Af and of left atrial size.

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