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ORIGINAL ARTICLE

A new score for detection of early cardioversion using intravenous amiodarone in recent onset atrial fibrillation

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KEYWORDS

Acute atrial fibrillation;
Antiarrhythmic medication;
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Abstract *Background:* Amiodarone is the only available intravenous antiarrhythmic medication in Egypt used in acute AF cardioversion. Cardioversion using IV amiodarone takes 6–8 h, and can be as late as 16 h. The aim of this study was to identify the clinical factors that are most associated with early (< 8 h) successful pharmacological cardioversion of AF, and use them to construct a weighted scoring system, that can help in deciding which patient to start with electric cardioversion to reduce time and cost of hospital stay.

Methods: The study included 83 consecutive patients; with first attack, recent onset AF lasting less than 48 h. The patients were divided into a study group (60 patients), and a validation group (23 patients). The study group patients were divided into Group A (cardioverted in less than 480 min), and group B (cardioverted at 480 min or more), and different clinical and echocardiographic data were collected and compared between the two groups. Relevant variables were entered in forward binary logistic regression analysis, and weighted score was constructed. The score was validated on the validation group.

Results: A 7 variable scoring system was constructed as follows: LA diameter < 3.35 cm 6 points, no significant MR 4 points, no history of DM 3 points, mean BP on presentation below 95 mmHg 3 points, presentation before 225 min of onset of symptoms 2 points, no history hypertension 1 point and no diastolic dysfunction 1 point, with final total score = 20 points. A ROC analysis was performed for the scored patients showing that all patients scoring 12 points or more are most likely to convert early with a sensitivity of 89.5% and a specificity of 92.7%, $P < 0.0001$. Score validation revealed sensitivity, specificity, and accuracy for detection of early cardioversion of 80%, 88% and 83%, $P = 0.006$ respectively.

Conclusion: The current study suggested a weighted scoring system, to predict the time to cardioversion in patients with recent onset first presentation with atrial fibrillation.

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1. Introduction

Atrial fibrillation (AF) is the most common single rhythm disorder encountered by emergency physicians, and cardiologists, with a prevalence of up to 5% of the population.[1] Hospitalization of patients with AF is also very common. Early conversion to sinus rhythm (SR) improves symptoms, prevents the detrimental effects of prolonged AF, and avoids expenses of prolonged hospitalization.[2] In patient with presumed recent-onset AF $\leqslant$ 48 h in duration, attempts to restore SR are the first line option.[3] Pharmacological cardioversion of AF to SR is commonly attempted.[4] Amiodarone is an antiarrhythmic class III agent with unique electrophysiological properties, and it has been used as an effective antiarrhythmic drug for many years, and its efficacy is proven in a wide spectrum of atrial and ventricular arrhythmias.[1] In the other hand, it's the only available intravenous (IV) antiarrhythmic medication in Egypt which can be used in acute AF cardioversion. Cardioversion of recent onset AF can be as late as 16 h, when amiodarone is used.[5] The aim of this work was to identify the clinical factors that are most associated with early (<8 h) successful pharmacological cardioversion of AF using IV amiodarone, and use them to construct a weighted and easily applied clinical scoring system, to determine patients who will mostly convert early (<8 h), and those who will convert later ($\geqslant 8$ h), shortening their hospital stay, by applying an alternative strategy e.g. electrical cardioversion as an initial strategy on presentation.

2. Patients and methods

The study was carried out in cardiology department Zagazig university hospitals. The study included consecutive patients admitted to CCU with recent onset; first attack of AF lasting less than 48 h. Informed consent was obtained from each patient. The necessary approvals were obtained from medical ethics and research committee in Zagazig University. Patients with hemodynamic instability, heart failure, congenital heart disease, rheumatic heart disease, acute coronary syndrome, previous history of embolic events, sick sinus syndrome, Wolff–Parkinson–White syndrome and contraindications to amiodarone were excluded from the study. None of the patients was on any classes I, III, or V antiarrhythmic medications.

Full clinical evaluation was carried out including the following: evaluation of risk factors, special habits, time from the first sensation of palpitation, drug history, history of hypertension and DM. Clinical examination includes General and local cardiac examination, presentation of blood pressure and heart rate. Laboratory investigations included the following: sodium, potassium, High sensitive troponin and high sensitive C-reactive protein.

All patients were admitted to CCU, monitored and received amiodarone HCl 150 mg IV infusion bolus, over 20 min, 1 mg/min IV infusion for 8 h, and then 0.5 mg/min IV infusion for 16 h or until cardioversion. If cardioversion failed for 24 h direct current cardioversion was performed under sedation. Cardioversion, whether pharmacological or electrical, was followed by oral amiodarone loading. Heart rate control was achieved by using the following: propranolol IV 0.15 mg/kg and then the patients were maintained on Metoprolol 25–100 mg twice daily, if contraindicated oral Diltiazem or Verapamil was used 120–360 mg daily in divided doses for both of them. All other aspects of management were carried out according to ACC/AHA/ESC 2006 Guidelines for the Management of Patients with Atrial Fibrillation.[6]

The enrolled patients underwent transthoracic echocardiography on admission. Echocardiography was performed using HP Sonos 5500 ultrasound machine (Philips, Netherlands) using 2.5 MHz transducer. The evaluation was conducted according to Feigenbaum et al.[7] Two-dimensional images from the standard parasternal long and short axis as well as apical views were obtained to determine the following: left ventricular (LV) volumes, ejection fraction (EF), Left atrial diameter, assessment of diastolic function, detection and assessment of mitral valve regurgitation (MR), and patients with grade II and more MR were considered to have significant MR. Linear left atrial dimension was obtained at end-systole just before mitral valve opening, using M-mode in the parasternal long axis view, with the M-mode plane passing through the aortic valve, the anterior, and the posterior walls of the left atrium. Evaluation of the left ventricular diastolic function was done using the following: tissue Doppler imaging obtained from the medial mitral valve annulus in the apical 4 chamber view. E/e' ratio was calculated, and the presence of diastolic dysfunction is determined if the ratio is more than 15. Evaluation of mitral regurgitation was done using color Doppler flow, and apical four chamber and parasternal long axis views were used. Calculation of the percentage of the regurgitant jet area to the left atrial area in both views was performed. A percentage less than 15% was considered grade 1 MR, 15–35% grade 2, 35–50% grade 3, and more than 50% grade 4. The higher percentage of the 2 views is considered, when the jet is stopped by LA wall at any side, and the grade was increased by one.

During their admission in CCU, heart rate and blood pressure were monitored. Automated blood pressure measurements were taken every 10 min, blood pressure measurements were recorded automatically and a trend curve was displayed and printed from the patient's monitor. Hourly change of mean blood pressure was calculated as percentage from the last recorded measurement for 8 h or until the patient is cardioverted. Heart rate was continuously monitored, and automated heart rate trends were recorded and printed from the patient's monitor; the percentage of change from last recording was calculated every 2 h for the first 8 h of admission or until cardioversion.

Patients were divided into two groups 1 – a study group ($n = 60$ patients) used to construct the scoring system and 2 – a validation group ($n = 23$ patients) used to validate the scoring system. The study group was divided according to the time of cardioversion into two groups: group A included patients who were cardioverted before 480 min of initiation of amiodarone infusion, and group B who were cardioverted at 480 min or more of initiation of amiodarone infusion.

Statistical analysis included comparing different parameters between study group and validation group, using independent t-test for numerical variables and chi-square for categorical variables to insure similarity. Analysis also included comparing different parameters between groups A and B, using independent t-test for numerical variables and chi-square for categorical variables. All significantly different variables were entered in a forward stepwise binary logistic regression analysis to select the best model. After selecting the best model,

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