



Original Research Article

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**COMPARATIVE ANALYSIS OF IBUTILIDE AND AMIODARONE IN CHEMICAL
CARDIOVERSION**

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Annotation: Cardioversion is a therapeutic intervention aimed at restoring normal sinus rhythm in patients with cardiac arrhythmias, particularly atrial fibrillation and atrial flutter. These arrhythmias can lead to complications such as thromboembolism, heart failure, and increased mortality. Management typically includes rate control, rhythm control, and anticoagulation, with rhythm control being achieved through electrical or pharmacological means. Chemical cardioversion is preferred for hemodynamically stable patients when electrical cardioversion is unsuitable. This method employs antiarrhythmic medications to disrupt abnormal impulses or re-entrant circuits. Ibutilide and amiodarone are commonly used due to their effectiveness and intravenous availability.

Pharmacological Properties:

- **Ibutilide:** A Class III antiarrhythmic, ibutilide prolongs cardiac action potential by activating sodium currents and inhibiting potassium channels, which helps interrupt re-entrant circuits. It has a rapid onset and short half-life, making it suitable for acute use, but requires continuous cardiac monitoring due to its narrow therapeutic margin.
- **Amiodarone:** A broad-spectrum agent affecting all four Vaughan Williams classes, amiodarone acts as a potassium, sodium, beta-adrenergic, and calcium channel blocker. Its complex pharmacokinetics include a long half-life and large volume of distribution. It is used intravenously for acute management and orally for long-term rhythm control.

Efficacy in Cardioversion:

Ibutilide is highly effective for rapid conversion of atrial flutter and recent-onset atrial fibrillation, with quicker conversion times, especially in organized re-entrant circuits. In contrast, amiodarone has a slower onset and lower immediate conversion rates but is effective in maintaining sinus rhythm post-conversion, particularly in patients with structural heart disease.

Safety and Adverse Effects:

Ibutilide's primary limitation is its proarrhythmic potential, leading to QT interval prolongation and risks like torsades de pointes, necessitating ECG monitoring. Pre-administration electrolyte correction is crucial. Amiodarone has a lower incidence of proarrhythmia but is linked to significant extracardiac side effects, including thyroid dysfunction and pulmonary issues, particularly with prolonged use. Acute administration may cause hypotension and bradycardia. Understanding the distinctions between ibutilide and amiodarone aids clinicians in making informed treatment decisions for arrhythmias.

Ibutilide is suitable for short-term chemical cardioversion in patients with recent-onset atrial flutter or atrial fibrillation without significant heart disease, making it ideal for emergency settings with adequate monitoring.

Amiodarone is preferred for patients with heart failure, left ventricular dysfunction, coronary artery disease, or hypertrophic cardiomyopathy. Its ability to maintain sinus rhythm makes it valuable in structurally compromised hearts, despite its slower onset and potential long-term toxicity.

Keywords: Chemical cardioversion, Ibutilide, Amiodarone, Atrial fibrillation, Atrial flutter, Antiarrhythmic drugs.

Purpose of the Study: The purpose of this study is to examine and clarify the roles of amiodarone and ibutilide in pharmacologic cardioversion of atrial arrhythmias, particularly atrial fibrillation and atrial flutter.

Material And Method:

This study was designed as a prospective, comparative clinical study conducted in the Department of Cardiology of Samarkand State Medical University . The study evaluates the efficacy and safety of intravenous amiodarone and ibutilide for pharmacologic cardioversion in patients presenting with atrial fibrillation or atrial flutter. The study

was carried out over a period of 12 months. A total of 118 patients diagnosed with recent-onset atrial fibrillation or atrial flutter (duration ≤ 7 days) were included in the study. Patients were enrolled after fulfilling eligibility criteria and providing informed consent. Patients with age ≥ 18 years, hemodynamically stable patients, ECG-confirmed atrial fibrillation or atrial flutter, duration of arrhythmia ≤ 7 days, willingness to participate in the study were included and patients with hemodynamic instability requiring immediate electrical cardioversion, history of severe bradycardia or high-grade atrioventricular block, prolonged QT interval at baseline (QTc > 450 ms in males, > 470 ms in females), severe electrolyte imbalance (uncorrected hypokalemia or hypomagnesemia), known hypersensitivity to amiodarone or ibutilide, severe hepatic or renal dysfunction, pregnant or lactating women were excluded.

Patients were randomly divided into two groups: Group A (n = 60) received intravenous amiodarone and Group B (n = 58) received intravenous ibutilide. Group A (IV amiodarone) received a loading dose of 5–7 mg/kg infused over 30–60 minutes, followed by additional doses up to a total of 1,200 mg over 24 hours if needed. Group B (IV ibutilide) received, 1 mg over 10 minutes, with a second 1 mg dose given after 10 minutes if sinus rhythm was not restored. All patients were continuously monitored in a cardiac care unit during drug administration and for at least six hours after the administration.

Thereafter, baseline assessment included detailed medical history, physical examination, 12-lead ECG, echocardiography, and laboratory tests including serum electrolytes, renal and liver function tests, and thyroid function were done. The primary outcome was successful conversion to normal sinus rhythm within 24 hours whereas secondary outcomes included the time required for cardioversion, recurrence of arrhythmia within 24 hours, changes in QT interval, and the occurrence of adverse events such as hypotension, bradycardia, and torsades de pointes. Continuous ECG monitoring was performed during and after drug administration, and electrolyte levels were corrected when needed to reduce the risk of arrhythmia. Data was analyzed using appropriate statistical methods, with continuous variables expressed as mean \pm standard deviation and categorical variables as percentages. Comparisons between groups were made using the independent t-test or chi-square test, with a p-value < 0.05 .

Results:

A total of 118 patients completed the study, with 60 (34 male, 26 female) in the amiodarone group and 58 (30 male, 28 female) in the ibutilide group. The mean age of patients was 58.4 ± 10.2 years in the amiodarone group and 56.9 ± 9.8 years in the ibutilide group. Males constituted 54.2% of the population, and common comorbidities included hypertension, diabetes mellitus, and ischemic heart disease. There were no significant differences between the two groups in terms of age, sex distribution, arrhythmia duration, or underlying medical conditions were seen. Baseline QTc intervals and electrolyte levels were also similar. Successful conversion to sinus rhythm within 24 hours was achieved in 41 patients (68,3%) in the amiodarone group and 46 patients (79,3%) in the ibutilide group. Ibutilide was particularly effective in patients with atrial flutter, achieving an 88% conversion rate. The mean time to cardioversion was significantly shorter in the ibutilide group (1.9 ± 0.8 hours) compared to the amiodarone group (8.6 ± 3.4 hours, $p < 0.001$).

Recurrence of arrhythmia within 24 hours was seen in 10 patients (16.6%) in the amiodarone group and 12 patients (20,7%) in the ibutilide group. QT interval prolongation was more frequent in the ibutilide group, as 13 patients (22,4%) were affected, whereas only 6 patients (10,3%) in the amiodarone group experienced mild prolongation. Only one patient in the ibutilide group developed transient torsades de pointes, which was managed with intravenous magnesium. Other adverse effects which were seen are mild hypotension in 5 patients (8,3%) and bradycardia in 4 patients (6,7%) in the amiodarone group, and 3 patients (5,2%) in the ibutilide group. Overall, both drugs were effective and relatively safe, with ibutilide producing faster cardioversion and amiodarone showing a lower risk of proarrhythmic events.

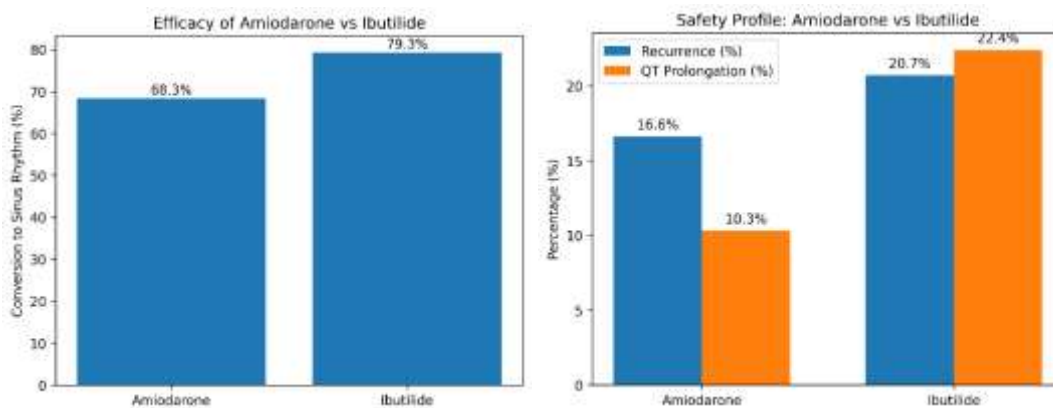


Figure 1. Efficacy and safety profile for Amiodarone and Ibutilide

Conclusion:

In this study, both amiodarone and ibutilide were found to be effective in achieving pharmacologic cardioversion in patients with recent-onset atrial fibrillation and atrial flutter. Ibutilide showed a faster onset of action and higher conversion rates, particularly in patients with atrial flutter, making it a great option for rapid rhythm restoration in hospitals. Amiodarone, although slower in producing cardioversion, showed a lower risk of proarrhythmic complications and was well tolerated, making it preferable in patients with structural heart disease or compromised cardiac function. Both drugs were generally safe, only mild and manageable adverse effects were observed. Overall, the choice between amiodarone and ibutilide should be decided by the patient's underlying condition, type of arrhythmia, and clinical priorities, balancing the need for rapid conversion with safety considerations.

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