

Conversion of atrial fibrillation to sinus rhythm during landiolol infusion

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Abstract A 71-year-old woman with a history of persistent atrial fibrillation underwent clipping of a ruptured cerebral artery aneurysm. During the surgery her cardiac rhythm was atrial fibrillation and the ventricular rate increased to 130 beats·min⁻¹. Administration of landiolol was started with 1-min loading infusion at 0.125 mg·kg⁻¹·min⁻¹ and continuous infusion at 0.04 mg·kg⁻¹·min⁻¹, which was effective in controlling the ventricular rate without causing hypotension. Approximately 120 min after the landiolol infusion was started, the atrial fibrillation was converted to sinus rhythm. Her sinus rhythm was maintained until she left the operating room, even after discontinuation of landiolol.

Key words Landiolol · Atrial fibrillation · Conversion

Introduction

Landiolol, a novel ultra-short-acting beta-blocker, is administered intravenously by continuous infusion, and is easy to titrate; thus, it is useful in the perioperative setting. There are now increasing numbers of case reports describing the successful management of intraoperative tachyarrhythmias, including atrial fibrillation, with landiolol [1–3]. We report herein a patient with persistent atrial fibrillation treated with landiolol, which not only controlled the ventricular rate effectively but restored sinus rhythm. To our knowledge, this is the first case report describing the conversion of atrial fibrillation during landiolol infusion.

Case report

A 71-year-old woman with a history of previous myocardial infarction and persistent atrial fibrillation was admitted because of a subarachnoid hemorrhage. Electrocardiogram, done on admission, showed atrial fibrillation with paroxysmal ventricular contractions. She had been medicated with aspirin, digoxin, diltiazem, and pilsicainide, but had stopped taking them after admission. On echocardiography, her left ventricular function was found to be normal. Clipping of the ruptured cerebral artery aneurysm was scheduled for the next day.

On arriving at the operating room, her cardiac rhythm was atrial fibrillation, with a ventricular rate of 90 beats·min⁻¹ and blood pressure of 110/65 mmHg. General anesthesia was induced with 5 mg midazolam, 0.1 mg fentanyl, and 5 mg vecuronium, and maintained with isoflurane 1%, nitrous oxide 4l·min⁻¹, and oxygen 2l·min⁻¹. After the surgical procedure was begun, her ventricular rate gradually increased to 130 beats·min⁻¹, while blood pressure decreased slightly. Fluid loading with 500 ml of acetated Ringer solution and 500 ml of hydroxyethylated starch failed to control the tachycardia. Consequently, administration of landiolol was started, with 1-min loading infusion at 0.125 mg·kg⁻¹·min⁻¹ and continuous infusion at 0.04 mg·kg⁻¹·min⁻¹. In a few minutes the ventricular rate was decreased to 80 beats·min⁻¹, and it stabilized at 70 to 80 beats·min⁻¹ thereafter. There was no significant change in blood pressure. Approximately 120 min after the landiolol infusion was started, conversion to sinus rhythm occurred. Landiolol infusion was stopped at the end of the surgery. Sinus rhythm was sustained until she left the operating room.

When she was visited in the ward the next day, her cardiac rhythm was atrial fibrillation again, and she had no clinical symptoms suggesting thromboembolism.

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Discussion

Atrial fibrillation with rapid ventricular response requires prompt treatment, because it can cause rate-related hemodynamic compromise, manifested perioperatively as hypotension and decreased cardiac output. There are two approaches to the treatment of this condition: one is electrical cardioversion or treatment with antiarrhythmic drugs to restore sinus rhythm, and the other is the use of rate-controlling drugs, allowing the atrial fibrillation to persist [4,5]. In hemodynamically unstable patients, electrical cardioversion should be used. In hemodynamically stable patients, pharmacologic cardioversion can be achieved with antiarrhythmic drugs such as procainamide and cibenzoline. The major drawback of cardioversion is an increased risk of stroke. Patients with atrial fibrillation lasting for 2 days or more have a 5% to 7% risk of clinical thromboembolism if cardioversion is not preceded by several weeks of warfarin therapy [4–6]. For this patient population, control of the ventricular rate should be achieved with digoxin; calcium-channel blockers, such as verapamil and diltiazem; and beta-blockers. Recent clinical trial results have shown that most patients with atrial fibrillation have similar outcomes with strategies for controlling ventricular rate compared with strategies for restoring sinus rhythm [7,8].

Electrical or pharmacologic cardioversion was not indicated in our patient, because she was hemodynamically stable, had persistent atrial fibrillation, and was not anticoagulated. To control the ventricular rate of the patient, beta-blockers were considered appropriate, because she had a history of previous myocardial infarction. Several studies have demonstrated the clinical efficacy of perioperative beta-blocker use to decrease cardiac complications in patients with risk factors or those with known coronary artery disease who are undergoing noncardiac surgery [9,10]. In the perioperative period, short-acting beta-blockers, such as esmolol and landiolol, are useful because their effects appear and diminish rapidly. Esmolol, which has been used in Europe and the United States for years, often causes hypotension. Landiolol was developed by altering the chemical structure of esmolol, and has less effect on blood pressure [11], and may be preferred to esmolol when the patient is not hypertensive. In our patient, landiolol was effective in controlling the ventricular rate of atrial fibrillation without causing hypotension. In addition, during landiolol infusion, conversion to sinus rhythm occurred, which we had not intended.

Although the patient had been medicated with digoxin, diltiazem, and pilsicainide, she was not taking these agents after admission. Therefore, it is unlikely that these drugs converted the atrial fibrillation. There is a possibility that the conversion happened spontane-

ously, but its timing strongly indicates the contribution of landiolol. In fact, most beta-blockers, including landiolol, have antiarrhythmic properties. Landiolol decreased the dysrhythmogenic dose of epinephrine in dogs [12], and restored sinus rhythm in patients with supraventricular or ventricular tachycardia [2]. Although there is no case report describing the conversion of atrial fibrillation due to landiolol, esmolol was reported to accelerate the conversion of recent-onset atrial fibrillation compared with diltiazem and verapamil [13,14]. Given the structural similarity to esmolol, landiolol may also facilitate the conversion of atrial fibrillation. Conversion to sinus rhythm can reduce the risk of thromboembolic complications and the need for anticoagulant therapy. However, when treating persistent atrial fibrillation, we should be aware of the risk that unintentional conversion may trigger thromboembolic complications.

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