Intravenous sotalol for the management of postoperative junctional ectopic tachycardia

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Introduction

Junctional ectopic tachycardia (JET) is a common postoperative arrhythmia seen in children undergoing surgery to repair congenital heart defects.[1,2] If conservative interventions such as cooling, sedation, weaning of inotropic therapy, and atrial overdrive pacing[3,4] are not adequate, intravenous (IV) antiarrhythmic drugs are used. The most commonly used antiarrhythmic drugs for the treatment of JET include amiodarone and procainamide.[4–6] Recently IV sotalol has become available, and initial studies and case reports have shown it to be safe and effective in the management of supraventricular and ventricular arrhythmias in children.[7–9] We report the first use of IV sotalol for the treatment of postoperative JET.

KEY TEACHING POINTS

- Intravenous sotalol can be considered as a treatment option for postoperative junctional ectopic tachycardia in patients with congenital heart disease.
- A single intravenous bolus of sotalol 1 mg/kg was able to achieve rate and rhythm control of postoperative junctional ectopic tachycardia.
- Administration of intravenous sotalol should be performed in a setting that allows close monitoring of rhythm, heart rate, corrected QT interval, and blood pressure.

Case report

A 2-month-old baby girl with trisomy 21 who underwent surgical repair with a primary closure of an atrial septal defect and pericardial patch closure of a ventricular septal defect presented to the cardiovascular intensive care unit (CVICU). The total cardiopulmonary bypass time was 118 minutes, and the total aortic cross-clamp time was 86 minutes. The postoperative transesophageal echocardiogram demonstrated no residual shunting and mildly depressed biventricular systolic function. She arrived to the CVICU with the following IV infusions: milrinone 0.5 μg/(kg•min), nicardipine 3 μg/(kg•min), and dexmedetomidine 0.5 μg/(kg•h). The immediate postoperative electrocardiogram showed sinus rhythm with right bundle branch block (Figure 1A).

In the evening of the operative day, she developed JET that gradually increased to a rate of 205 beats/min (Figure 1B). Initially she was cooled, inotropes were weaned, and sedation was increased. The above interventions had a transient decrease in her JET rate, but her heart rate gradually increased again to 210 beats/min. Laboratory data showed normal electrolytes with the exception of a mildly elevated potassium level of 5.0 mmol/L. Her magnesium level was 2.6 mg/dL. Given persistent JET at rates not amenable to overdrive pacing, the decision was made to administer an IV antiarrhythmic drug. After consultation with the electrophysiologist, the decision was made to administer a single bolus dose of IV sotalol 1 mg/kg to be given over 1 hour. This single dose resulted in the reduction of the JET rate to 130–140 beats/min with intermittent sinus rhythm and sinus capture beats. The corrected QT (QTc) interval after the infusion in the setting of right bundle branch block was 491 ms compared to the pre sotalol QTc interval, which was 484 ms. The patient remained rate controlled, with no need for any additional antiarrhythmic drug and was in sinus rhythm by postoperative day 1. She was discharged from the CVICU to a step-down unit by postoperative day 8 and discharged home on postoperative day 21 with no complications.

Discussion

To our knowledge, this is the first report of the use of IV sotalol for the management of postoperative JET in a pediatric patient with congenital heart disease. Oral sotalol has been used in the past for the treatment of congenital JET in a small

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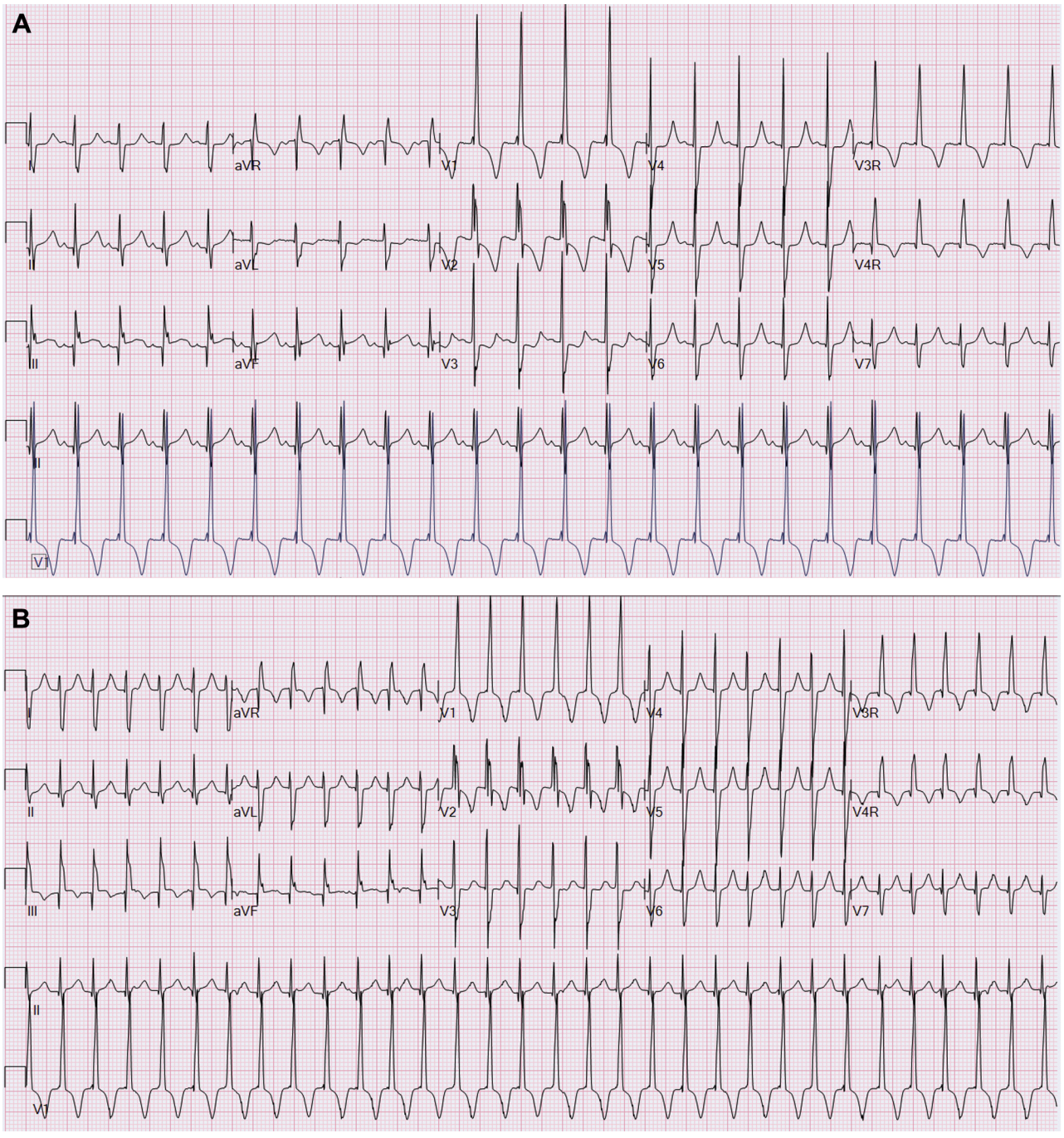

Figure 1 **A:** Baseline postoperative electrocardiogram showing sinus rhythm with right bundle branch block. **B:** Electrocardiogram showing junctional ectopic tachycardia at a rate of 205 beats/min with the underlying right bundle branch block and ventriculoatrial dissociation.

number of patients with mixed results.[10–12] Because IV sotalol has recently become available, there is limited literature on its use. Publications have shown that IV sotalol can be used for the management of atrioventricular reentrant tachycardia, ectopic atrial tachycardia, atrial flutter, and ventricular tachycardia.[7–9]

Antiarrhythmic drug use for the treatment of JET varies significantly across centers.[13] The mainstay for the medical treatment of postoperative JET has been the use of IV amiodarone and procainamide. Although amiodarone has been effective in treating JET, the use of amiodarone has been associated with dose-related adverse effects including hypotension, bradycardia, atrioventricular block, and cardiovascular collapse.[5,14] Procainamide has been shown to be effective in treating JET[6]; however, treatment requires that drug levels be monitored. In the past, these drug level tests were frequently performed in-house with short turnaround times; now drug level tests are frequently send-out tests that have longer turnaround times, making it harder to acutely manage procainamide infusions. Also, recently there have

been shortages of procainamide, making it unavailable for use at times.[15] Given increasing concerns for adverse effects of amiodarone, shortages of procainamide, and longer turnaround times of drug tests, newer treatment options for postoperative JET are needed.

Similar to amiodarone and the procainamide metabolite *N*-acetyl procainamide, sotalol has class III antiarrhythmic properties with some mild β-adrenergic blocking effects. Its recent availability as an IV infusion allows its use in the postoperative setting. Monitoring for adverse effects of sotalol can be easily done with electrocardiography and cardiac monitoring, without requiring send-out laboratory tests. The published data on IV sotalol are limited, and the rate of cardiovascular collapse and adverse effects of sotalol have been found to be low.

Our case report demonstrates successful treatment of postoperative JET with a single dose of IV sotalol 1 mg/kg given over 1 hour. No adverse effects, such as proarrhythmias, bradycardia, or hypotension, were seen in our patient. In the setting of right bundle branch block, there was no significant QTc prolongation. Given that the administration of sotalol (IV or oral) can predispose patients to developing significant arrhythmias, we continue to recommend that the administration of IV sotalol be performed in a setting that allows close monitoring of rhythm, heart rate, QTc interval, and blood pressure. In the future, prospective studies should be performed to further evaluate the safety and efficacy of IV sotalol for the treatment of postoperative JET.

Conclusion

In our patient the administration of a single dose of IV sotalol 1 mg/kg over 1 hour was effective in the management of postoperative JET. The recent availability of sotalol in an IV form adds to the armamentarium of class III antiarrhythmic drugs that can be used for the management of this relatively common and potentially debilitating postoperative arrhythmia.

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