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Junctional ectopic tachycardia in late period after early postoperative complete atrioventricular block: Messenger of return to normal sinus rhythm? : Explanation with four case series

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Abstract Junctional ectopic tachycardia(JET) is a rare childhood arrhythmia originating from the area adjacent to the atrioventricular(AV) node. It often occurs after surgical procedures like repair of Tetralogy of Fallot, atrioventricular septal defect and ventricular septal defect, which are all performed in that area. While AV block (AVB) can occur after JET, it is very rare for late JET occurring after early postoperative AVB to be followed by normal sinus rhythm (NSR). There is no information in the literature related to the pathophysiology of this phenomenon. In this text, we present 4 patients who developed complete AV block(CAVB) in the early postoperative period (within the first 24 h) after JET in late period (>72 h) and returned to NSR with first-degree AV block and then NSR during follow-up. Based on these cases, we hypothesize that there is a link between late JET after early postoperative CAVB and return to NSR.

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Keywords: Early period; Postoperative complete atrioventricular block; Late period; Junctional ectopic tachycardia; Normal sinus rhythm

Introduction

Junctional ectopic tachycardia (JET) is a rare childhood arrhythmia most commonly seen after congenital heart disease surgery. It originates from an area adjacent to the atrioventricular node or a region with abnormal automaticity. The prevalence of postoperative JET is reported at 5%–11% [1–4]. The pathophysiology of this tachycardia is not entirely clear; it is thought to be the result of surgical manipulations that affect the conducting system of the heart. Junctional ectopic tachycardia is most often observed after surgical repair of Tetralogy of Fallot (TOF), atrioventricular septal defect and ventricular septal defect (VSD), all of which are performed in close proximity to the atrioventricular (AV) node. Postoperative JET generally occurs in the first 24 h after surgery, is self-limiting and spontaneously resolves within 1 week. However, it may lead to significant morbidity and mortality as rapid heart rate and AV dyssynchrony cause insufficient ventricular filling and reduction of cardiac stroke volume [3].

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While AV block (AVB) can be seen after JET, it is very rare for late JET after early postoperative AVB to be followed by normal sinus rhythm. There is no information in the literature regarding the pathophysiology of this phenomenon [2,4,5].

We have noticed that the scenario of 4 patients was similar in the pediatric cardiac intensive care unit in our center between 2010 and 2016. Therefore, in this text, we describe 4 patients with complete AV block (CAVB) in the early postoperative period (within first 24 h) followed by late JET (>72 h) and a return to normal sinus rhythm (NSR) with first-degree AVB during follow-up. We hypothesize that there may be a link between CAVB in the early postoperative period (within the first 24 h), then occurring late JET (>72 h) and eventual return to NSR.

Case report 1

A 15-month-old 10 kg female patient developed CAVB on postoperative day 1 after total TOF repair. During implantation of temporary pacemaker on postoperative day 4, the patient developed JET with a rate of 165 beats per minute (bpm). JET diagnosis was confirmed with atrial ECG and adenosine administration. When JET persisted despite cooling, sedation,

Table 1
Characteristics of conduction system in postoperative period of patients.

Case no.	Age (months)	Weight (kg)	Diagnosis	Operation	CAVB within first 24 h in postoperative period	JET(>72 h) (postoperative day)/HR(/min)	First degree AVB before NSR	NSR (postop day)
1	15	10	TOF	Total TOF repair	+	4/165	+	6
2	5	5	ASD + VSD	ASD + VSD closure	+	5/180	+	10
3	90	22	TOF	Total TOF repair	+	4/160	+	10
4	6	5	CAVCD	Total CAVCD repair	+	3/169	+	8

ASD: atrial septal defect, CAVB: complete atrioventricular block, CAVCD: complete atrioventricular septal defect, HR: heart rate, JET: junctional ectopic tachycardia, NSR: normal sinus rhythm, postop: postoperative, TOF: Tetralogy of Fallot, VSD: ventricular septal defect.

analgesia and reduction of inotropes, amiodarone infusion was started. Two days later, the patient returned to sinus rhythm with first degree AVB and then NSR (Table 1).

Case report 2

A 5-month-old 5 kg male patient developed CAVB on postoperative day 1 after surgical atrial septal defect and VSD closure. During implantation of temporary pacemaker on postoperative day 5, the patient developed JET with a rate of 180 bpm. JET diagnosis was confirmed with atrial ECG and adenosine administration. When JET persisted despite cooling, sedation, analgesia and reduction of inotropes, amiodarone infusion was started. Six days later, the patient returned to sinus rhythm with first degree AVB and then NSR (Table 1).

Case report 3

A 7.5-year-old 22 kg male patient developed CAVB on postoperative day 1 after total TOF repair surgery. During implantation of temporary pacemaker on postoperative day 4, the patient developed JET with a rate of 160 bpm. JET diagnosis was confirmed with atrial ECG and adenosine administration. When JET persisted despite cooling, sedation, analgesia and reduction of inotropes, amiodarone infusion was started. Six days later, the patient returned to sinus rhythm with first degree AVB and then NSR (Table 1).

Case report 4

A 6-month-old 5 kg female patient developed CAVB on postoperative day 1 after total CAVCD (complete atrioventricular septal defect) repair surgery (Fig. 1). During implantation of temporary pacemaker on postoperative day 3, the patient developed JET with a rate of 169 bpm (Fig. 2). JET diagnosis was confirmed with atrial ECG (Fig. 3). When JET persisted despite cooling, sedation, analgesia and reduction of inotropes, amiodarone infusion was started. Five days later, the patient returned to sinus rhythm with first degree AVB and then NSR (Figs 4 and 5) (Table 1).

Discussion

The pathophysiology of JET is thought to be linked with surgical manipulations that affect the conduction system of the heart [3]. Disruption of ionic integrity of cell membranes may trigger automaticity. Disrupted autonomic control of the conduction system may also play a role in JET [6]. While

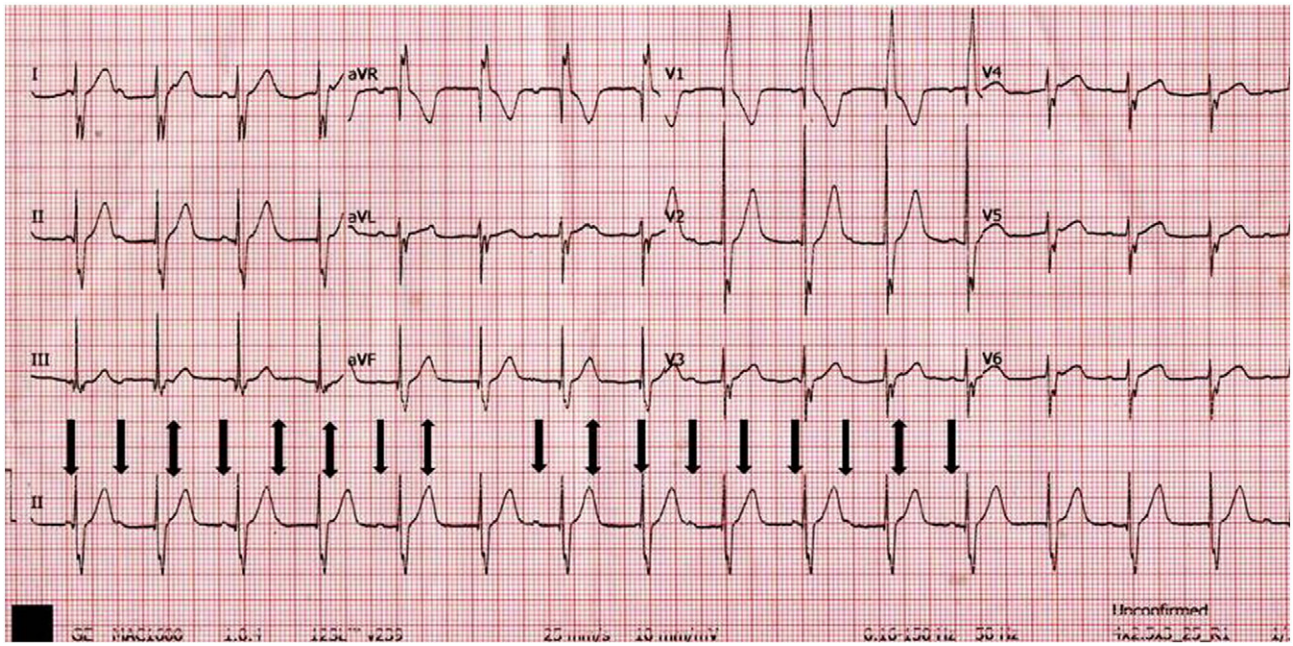

Fig. 1. Complete AV block in 12-lead ECG (ventricular rate: 94 bpm, atrial rate: 150 bpm, wide QRS duration: 100 ms). Black arrows show P waves.

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