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CASE REPORT

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Junctional ectopic tachycardia in neonatal enterovirus myocarditis

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Abstract

Differential diagnosis is challenging in poor conditioned neonates referred to the emergency room. Infectious disease is common, yet tachycardia should alert the clinician to look for cardiac arrhythmia and comprise. Tachycardia can lead to cardiomyopathy and should warrant further diagnostics for myocarditis, especially in rare or unusual combination of arrhythmias.

KEYWORDS

echovirus 6, enterovirus, junctional ectopic tachycardia, myocarditis, newborn

1 | INTRODUCTION

A neonate, referred to the emergency room with feeding difficulties and a grayish skin color, was initially diagnosed junctional ectopic tachycardia (JET). After diagnostic workup, acute echovirus 6 myocarditis was detected and treatment for both entities was initiated. On 3-month follow-up, cardiac function was normalized and JET had not recurred.

Myocarditis in neonates is a potentially life-threatening disease often caused by enteroviruses.[1] Histological pattern was found in children who suffered from sudden unexpected death, and cardiac arrhythmia is thought to be a major cause of death.[2,3] Junctional ectopic tachycardia (JET) is a rare arrhythmia more often reported in the postoperative setting than as a congenital form and very difficult to control.[4-6] Junctional ectopic tachycardia has been described as being associated with myocarditis in Lyme disease and coxsackievirus B3 myocarditis.[7,8] Yet, to the authors knowledge this is the first report of a neonate presenting with a junctional ectopic tachycardia caused by myocarditis induced by echovirus 6.

2 | CASE

We report the case of a female neonate (delivered at 37 weeks' gestation by cesarean section because of pathological Doppler sonography of the placental vessels, weighing 2.2 kg), apparently healthy. She was presented to the emergency room at the age of 11 days because of feeding difficulties and a grayish skin color. Therapy for suspected septic shock was initiated. After transfer to a tertiary center, a narrow complex tachycardia at 230-280 bpm (Figure 1A) was seen while echocardiographic study revealed a severely compromised LV function. Adenosine (twice 0.3 mg/kg) and electric cardioversion (2 J/kg) were not successful. It was followed by a loading dose of digoxin, initiation of mechanical ventilation, and transfer to our specialized center in a severely compromised hemodynamic state. Tachycardia-induced cardiomyopathy was suspected. Heart rate control was achieved by amiodarone iv (9 µg/kg/min) having tried transesophageal overdrive pacing, electrical and pharmaceutical cardioversion including ivabradine. After administration of amiodarone, the tachycardia was classified as junctional ectopic tachycardia due to

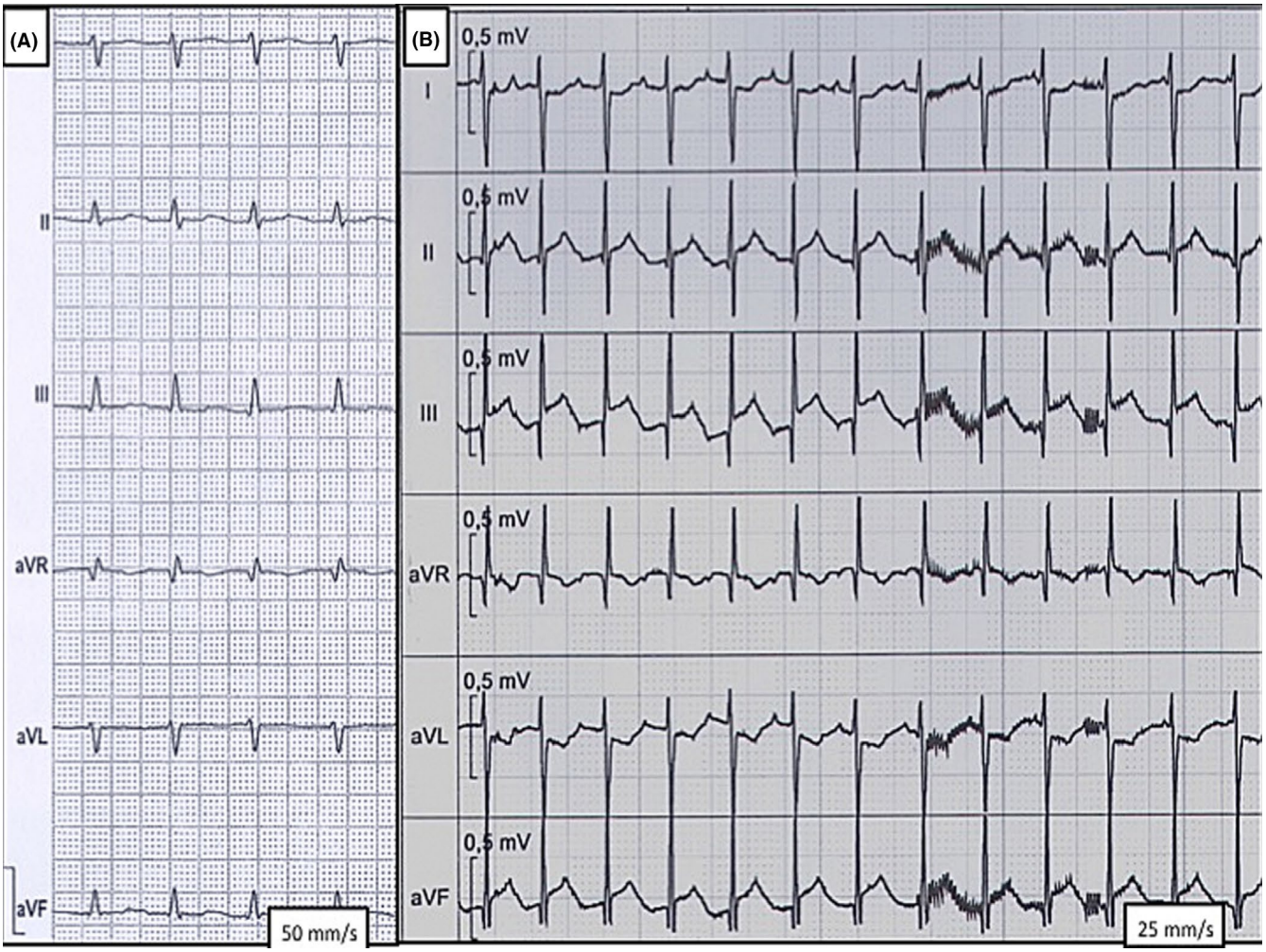

FIGURE 1 A, Initial ECG (50 mm/s) of limb leads showing a regular narrow QRS tachycardia with a heart rate of approximately 230 bpm. The P-waves are masked due to 1:1 retrograde conduction (standard voltage: 10 mm equals 1 mV). B, ECG (25 mm/s) of the same patient after administration of loading dose digoxin and amiodarone now displaying the typical ECG criteria for JET: narrow QRS complexes and a ventricular rate (approx. 170-180 bpm) exceeding the atrial rate

typical ECG criteria (Figure 1B). It resolved after 6 hours of amiodarone which was continued for another day. Pro-BNP level on admission was 114 885 ng/L, troponin T 3891 ng/L. Still, as biventricular function remained severely impaired, coronary artery anomaly was ruled out by catheterization. Myocardial biopsy was initially dismissed due to the procedure's high risk. Treatment for viral myocarditis (intravenous immunoglobulin, 2 g/kg) was initiated after extraction of enterovirus RNA from EDTA blood. Between days 3 and 11 of hospital stay, amiodarone had to be resumed and was very slowly reduced as intra-atrial reentrant tachycardia had evolved. With this therapy, biventricular function slowly improved. Once a hemodynamically stable condition was established, the patient was transferred to a tertiary center paying tribute to the family setting. Medical therapy included digoxin, captopril, carvedilol, and spironolactone.

On follow-up after 3 months, elective RV-endomyocardial biopsy revealed persisting echovirus 6 (nested PCR, DANN-sequencing) alongside chronic lymphocytic myocarditis (Figure 2) while cardiac function on echocardiographic study using 2D-strain was normalized. Up to date there was no relapse of the arrhythmia.

3 | DISCUSSION

JET is a rare automatic arrhythmia originating in the region of AV node or His bundle. Characteristic ECG findings include AV dissociation with a ventricular rate that exceeds atrial rate or retrograde 1:1 association.[9] In our case, P-waves were initially masked due to 1:1 retrograde conduction, yet pathognomonic ECG criteria appeared after administration of loading dose digoxin and initiation of amiodarone. AVNRT as differential diagnosis was dismissed due to no response to either adenosine or electric cardioversion. JET is well known to appear after surgery

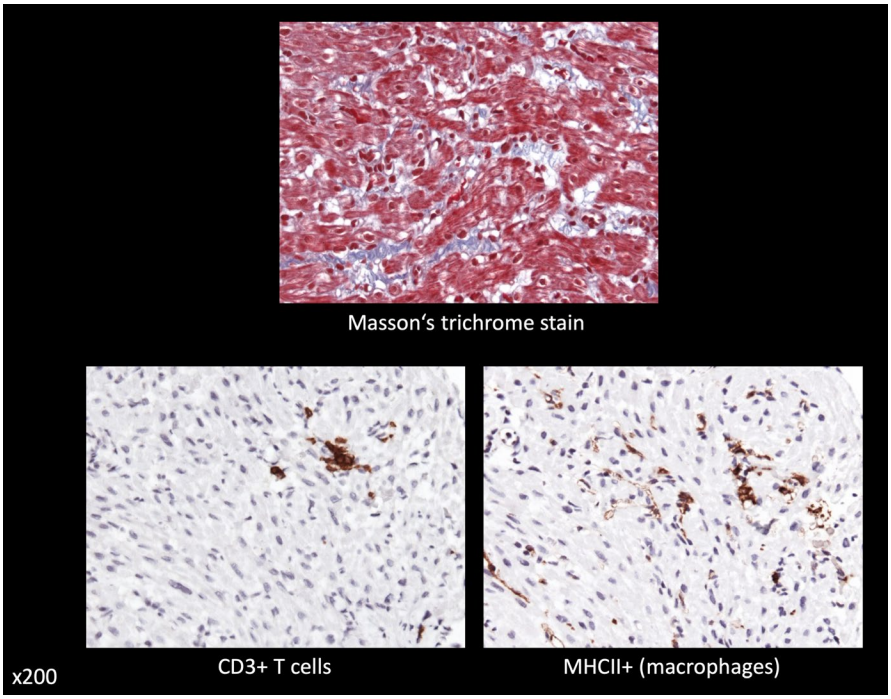

FIGURE 2 Histopathological images with 200× magnification of the patient's endomyocardial biopsy taken on follow-up after 3 mo. It shows chronic lymphocytic myocarditis with positive stains for CD3 T cells and MHC class II cells (macrophages) (images courtesy of Prof. Karin Klingel, Head of Cardiopathology, University Hospital Tübingen, Germany)

for congenital heart defects or as a congenital form with most patients being presented before 6 months of age.[5,9] Coxsackievirus B is the agent most commonly encountered in pediatric myocarditis.[1] Other enteroviruses like echoviruses 9 and 11 are known to cause severe diseases especially in neonates.[10,11] Echovirus 6 in particular is stated to cause potentially fatal hepatitis, pneumonitis, and meningoencephalitis in infants.[12-14] Lee et al reported on prognostic factors of infections with echovirus 6 and 9 favoring a poor outcome, but it is not described whether echovirus 6 was actually associated with myocarditis.[10,15,16] While arrhythmias like ventricular tachycardia, supraventricular tachycardia, and high-grade or complete heart block are frequent findings regarding viral myocarditis and are diagnosed in almost half of the hospitalized patient population, JET is very rarely seen in this setting.17,18 There are only a few case reports describing JET in patients with myocarditis related to Coxsackievirus B and Lyme disease while none regarding echovirus 6. The arrhythmia seems to resolve over time as myocardial inflammation improves.[6-8,19] Since infection with echovirus 6 can lead to fatal outcome in neonates, it should also be considered in the differential diagnosis of rare arrhythmias as symptom of myocarditis.

4 | CONCLUSION

Junctional ectopic tachycardia is a very rare but dangerous complication of viral myocarditis. In the presented case, the tachycardia could be managed using combined antiarrhythmic drug therapy.

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

JW: contributed to conceptualization and drafting of the manuscript; RAG: contributed to critical revision and approval of the manuscript; CP: contributed to conceptualization and critical revision.

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