Indian Pacing and Electrophysiology Journal 22 (2022) 238–240

Contents lists available at ScienceDirect

Indian Pacing and Electrophysiology Journal

journal homepage: www.elsevier.com/locate/IPEJ

Successful cryoablation of junctional ectopic tachycardia is feasible in a 13.4kg, 18-month-old toddler

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ARTICLE INFO

Article history:
Received 11 February 2022
Received in revised form
6 May 2022
Accepted 30 May 2022
Available online 2 June 2022

ABSTRACT

JET (junctional ectopic tachycardia) is a complicated and rare form of supraventricular tachycardia that is associated with a high rate of morbidity and mortality. Pharmaceutical management can be insufficient, and cryoablation has been described for congenital JET management. We describe cryoablation for congenital JET in an prior 32-week gestational aged, 18-month-old (corrected 16-month-old) with no JET post-ablation with normal Holter and follow-up within 6 months following cryoablation. This report demonstrates the safety and feasibility of cryoablation in patients as young as 18 months old.

1. Introduction

Junctional ectopic tachycardia (JET) is a complicated and rare form of supraventricular tachycardia that can present either as a primary idiopathic disorder of infancy (congenital JET) or post-operatively following surgery for congenital heart disease. The congenital form typically presents in the first six months of life in a persistent and sustained form, lasting up to 90% of the time [1]. The morbidity and mortality rate for congenital JET is high, with death occurring in 35% of cases [2]. In addition, pharmaceutical management for congenital JET can be insufficient, with many patients requiring a combination of two or more antiarrhythmics for rhythm control [3]. Cryoablation has been successful for congenital JET management, with one study showing an initial success rate of 85% in patients as young as 2.4 years of age [4]. There is only one other previously published case report demonstrating the use of cryoablation for congenital JET in a patient under two years of age [5]. We present a case of cryoablation congenital JET in an 18-month-old infant weighing 13.4 kg which suggests the feasibility of cryoablation in this population.

2. Case

The patient was born at 32 weeks gestational age by vaginal delivery to a 29-year-old G1P0 mother with a pregnancy complicated by late prenatal care, insulin-controlled gestational diabetes, cervical insufficiency diagnosed at 24 weeks, and premature prolonged ROM. A fetal echocardiogram showed normal cardiac anatomy. At 17 days of age, he was admitted to the neonatal intensive care unit for junctional ectopic tachycardia and was discharged on propranolol 0.35 mg/kg/dose q6 hours. He had a breakthrough of JET at one month of age, which was found during a visit with his primary care physician, presenting with feeding intolerance and a heart rate of 180–200 beats per minute while asleep. He was admitted to the hospital, where he was transitioned from propranolol to Sotalol. He continued to have breakthrough episodes of JET on sotalol doses up to 11mg and was admitted again to the hospital at four months of age. An echocardiogram at this time showed normal cardiac anatomy but mildly diminished left ventricular function with a left ventricular ejection fraction of 45%. Sotalol was discontinued at this time and he was discharged on oral flecainide 13.4mg q8 hours. His flecainide was gradually increased over the subsequent 11 months, but he continued to have breakthrough episodes of JET on flecainide up to 145 mg/m^2 per day. His breakthrough symptoms were associated with systolic left ventricular dysfunction.

He presented at 18 months of age (corrected 16 months) and a weight of 13.4kg (BMI 19.09) for an electrophysiology study and cryoablation due to tachycardia-induced cardiomyopathy and a desire for a drug-free lifestyle. Under general anesthesia utilizing

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Peer review under responsibility of Indian Heart Rhythm Society.

https://doi.org/10.1016/j.ipej.2022.05.004

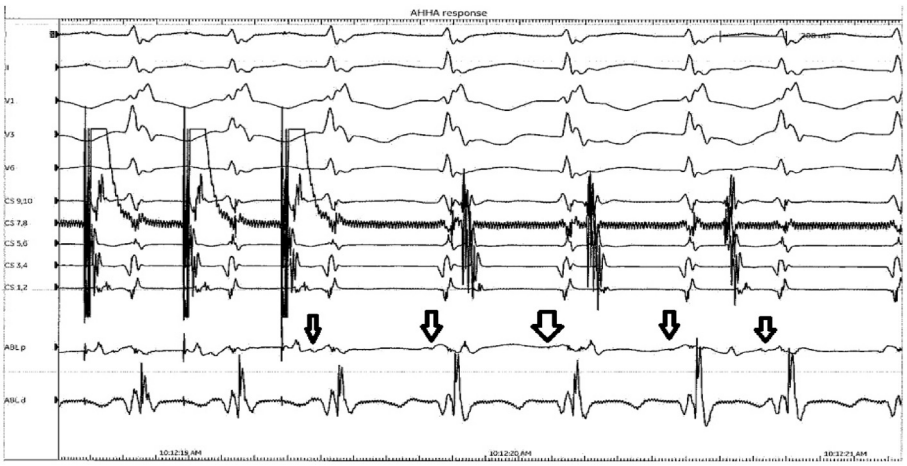

Fig. 1. Junctional ectopic tachycardia with atrial pacing A-H-H-A response with arrows denoting His deflection.

the Seldinger technique, a 4-French femoral venous access point was placed in the left femoral vein and an 8-French femoral venous access point was placed in the right femoral vein. Via a venous access point each in the right and left femoral vein, a 5-Fr Live-wire octopolar and 4-Fr decapolar catheters were placed, respectively. Mapping with the Live-wire, we localized the earliest ventricular activation just lateral of the His-bundle under the tricuspid valve annulus and noted the earliest ventricular signal with the smallest amplitude His-signal, after atrial pacing yielded an A-H-H-A response (Fig. 1). A 47mm Cryocath was then exchanged for the Livewire (via 8-Fr sheath) after testing and used to perform a Cryomap test lesion (without AV block noted) and subsequent 4-min, 3-min, 4-min Cryoablation lesion set in this similar area. The JET transitioned to sinus rhythm within 8.9 seconds of the initial cryoablation lesion (Fig. 2A and B). There was normal AV node function pre and post-ablation, and no inducible JET post-ablation. A Holter performed 1 month, 2 months and 5 as well as 6 months following cryoablation showed normal findings with no recurrence of JET thus far without any degree of atrioventricular block and with normal echocardiogram and electrocardiogram performed 6 months later.

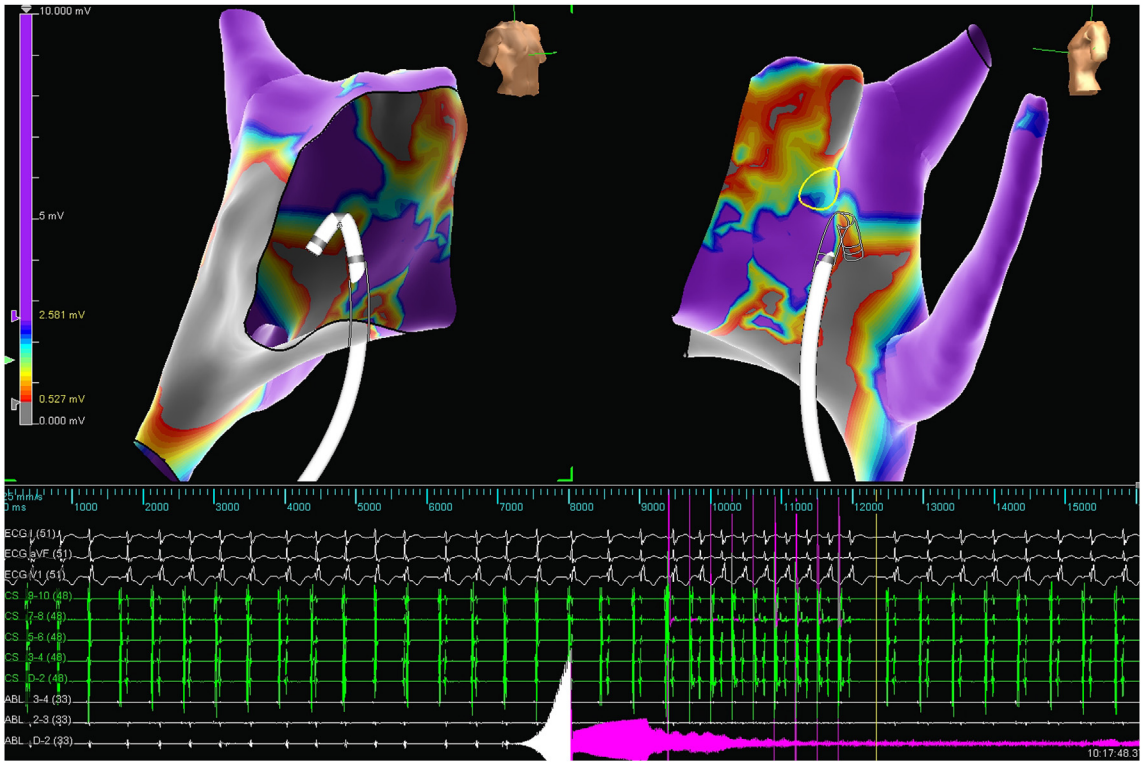

Fig. 2A. JET termination during ablation.

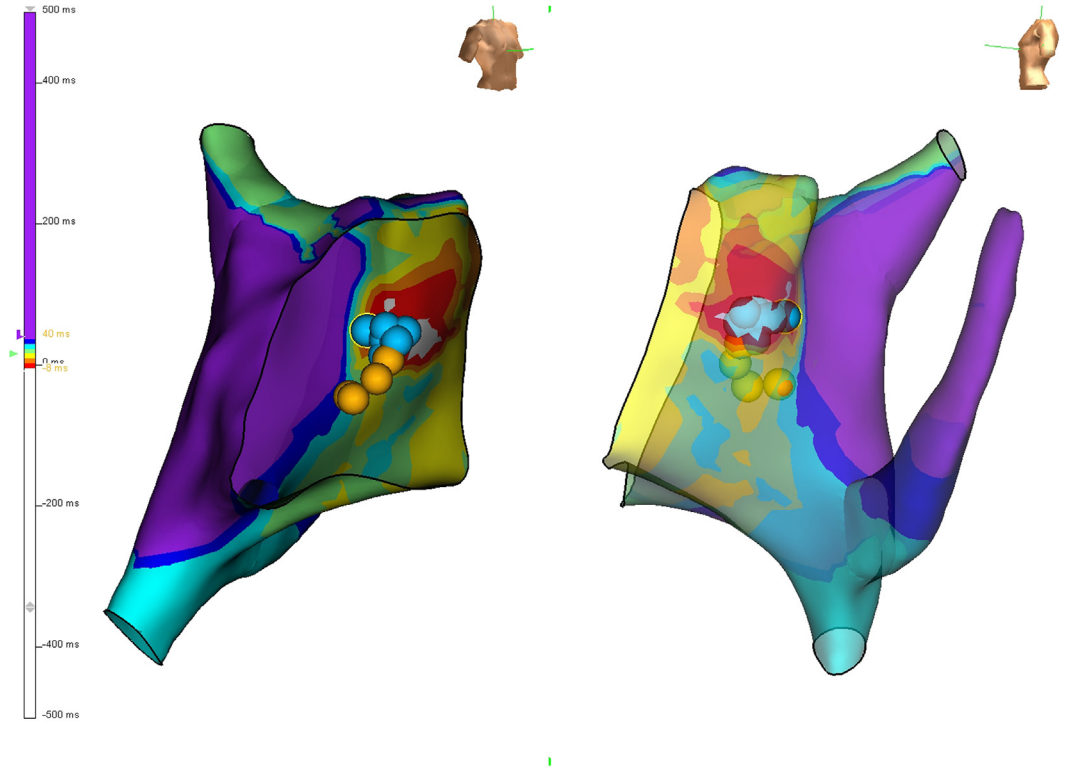

Fig. 2B. Early ventricular localization on the Ensite 3-dimensional map with white noting earliest onset of ventricular signal. Blue lesions denote cryoablation lesions and yellow denote His bundle location.

3. Discussion

This is a case of successful cryoablation for congenital JET with no evidence of recurrence 5 months post-cryoablation. There has also been another previously reported case of successful cryoablation in a 1-year-old infant for congenital JET [5]. A small number of case reports cannot make claims about the safety and efficacy of this procedure in infants, but they can suggest the feasibility of cryoablation for congenital JET in infants. Interventional therapies have demonstrated success, including cryoablation in those over 2 years of age, but perhaps the timing of ablation should be considered earlier with these patients [1]. Technically, in patients this size, fewer access points prevent venous complications, and our patient had a 4-French femoral venous access in the left femoral vein to allow coronary sinus access/atrial pacing, with an 8-French femoral venous access point in the right femoral vein to allow for mapping and subsequent cryoablation. Given the high degree of AV block associated with radiofrequency ablation of congenital JET, cryoablation should likely be considered first-line [1,4,5].

4. Conclusion

Safety and feasibility of cryoablation of congenital JET in an 18-month, 13.4 kg patient is demonstrated. This may be considered in patients this young in the future.

Declaration of competing interest

There are no financial conflicts of interest to disclose.

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