

# Successful Cardiac Resynchronization in a Small Infant with Single Site Left Ventricular Pacing

Alexandra M. Menillo, DO, FAAP<sup>1,2</sup>; Christopher Ratnasamy, MD, FHRS<sup>1,2</sup>

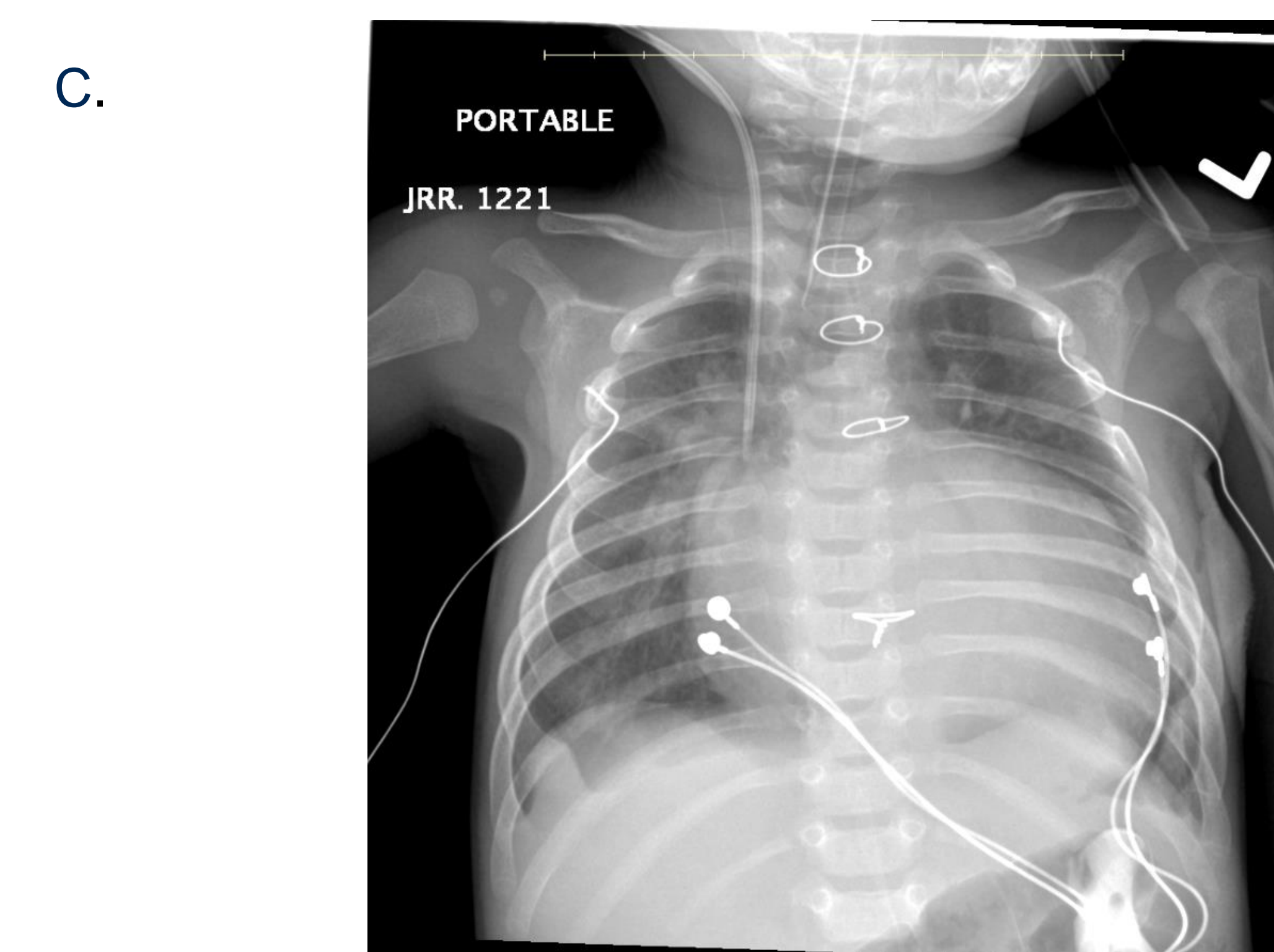
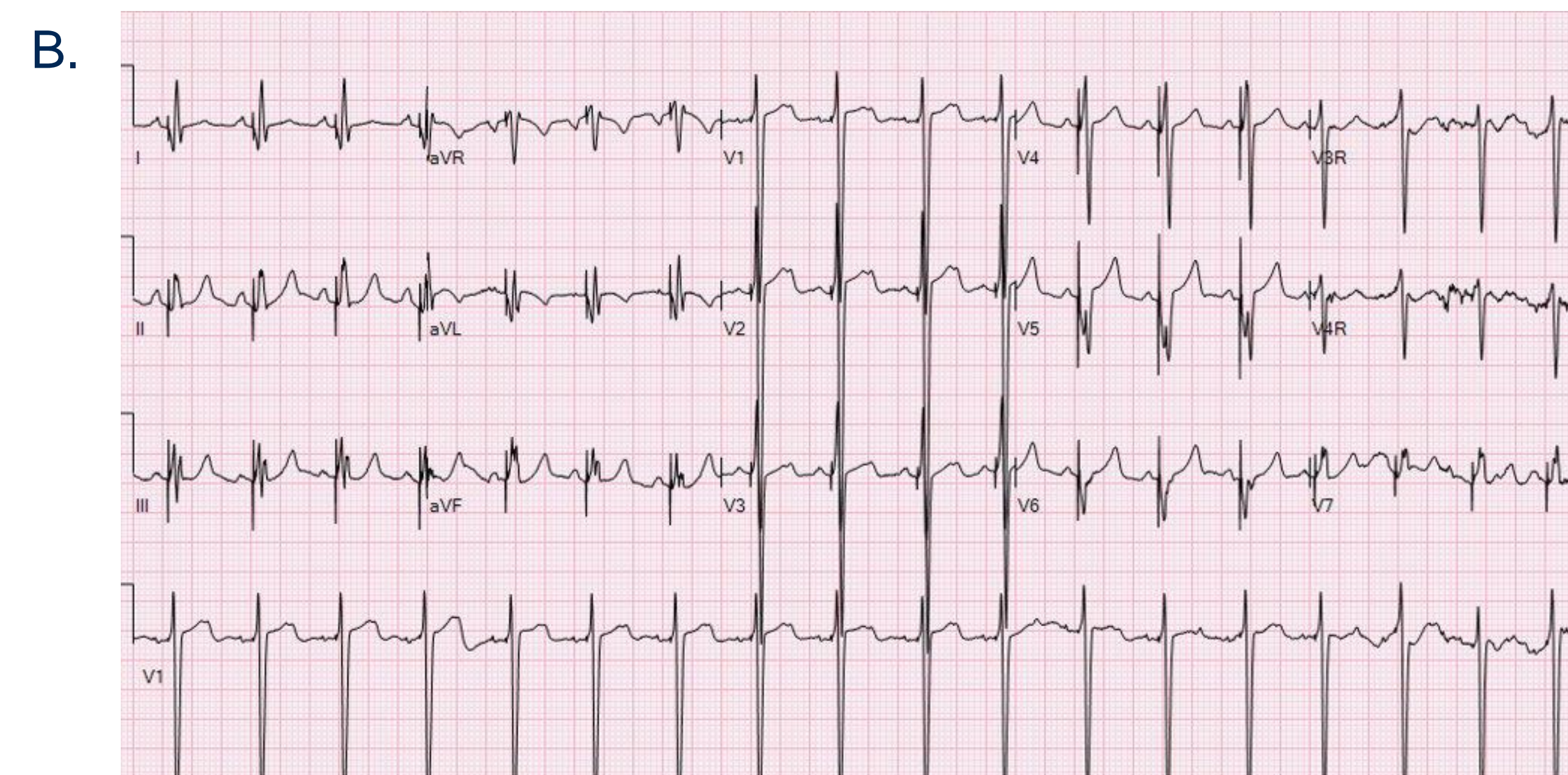
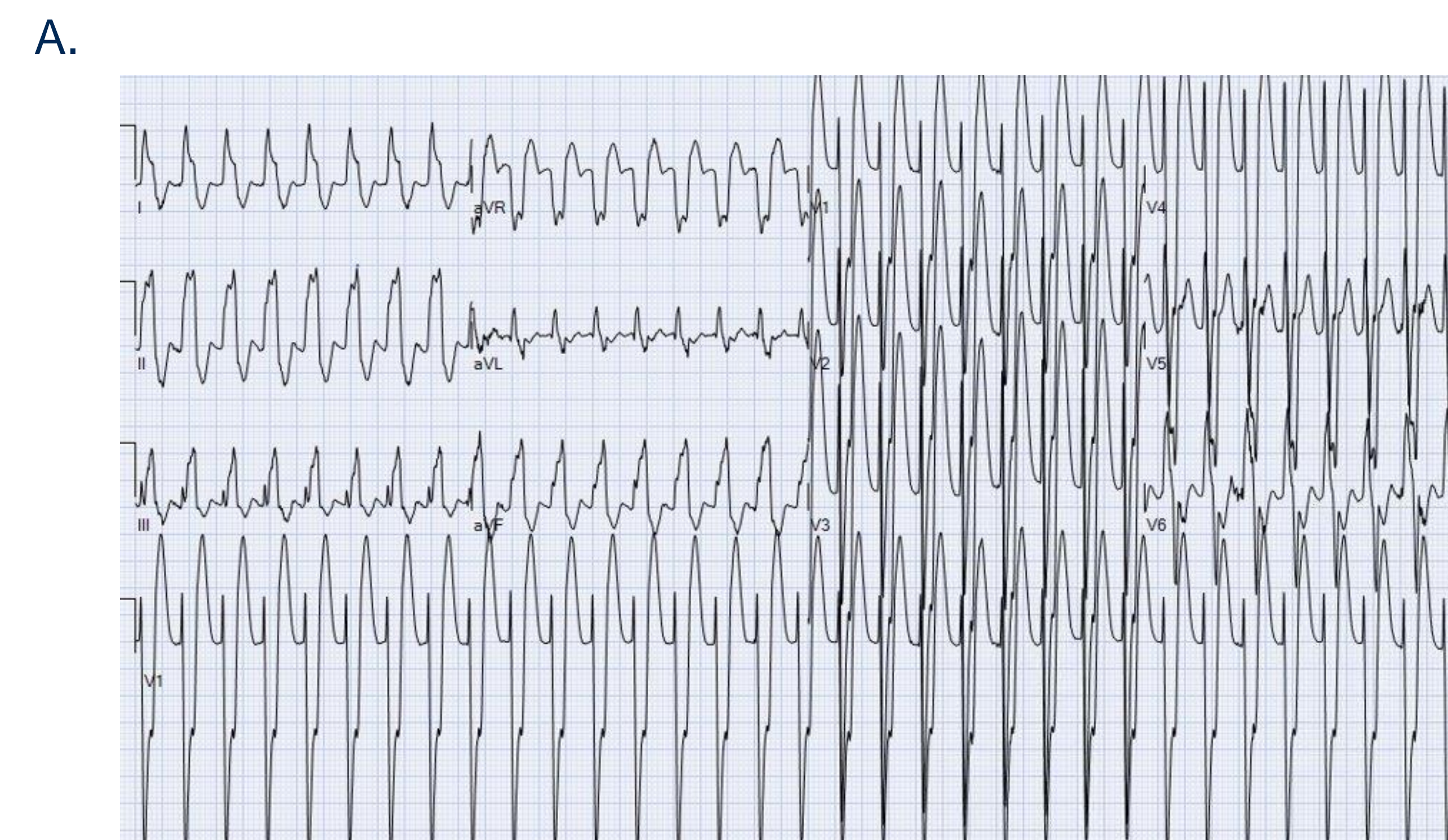
Betz Congenital Heart Center, Spectrum Health Helen DeVos Children's Hospital, Grand Rapids, MI, USA<sup>1</sup>; Pediatrics and Human Development, Michigan State University College of Human Medicine, Grand Rapids, MI, USA<sup>2</sup>

## Introduction

Electrical dyssynchrony caused by abnormal ventricular conduction has been shown to affect mechanical dyssynchrony, therefore resulting in less effective cardiac performance and heart failure.<sup>1,2</sup> Cardiac Resynchronization Therapy can alleviate electrical dyssynchrony and provide more synchronous ventricular contraction.<sup>2</sup> We present a small infant with d-TGA status post arterial switch operation who underwent successful resynchronization with dual chamber lead placement.

## Case Description

- 3-month-old male with a history of d-TGA status post arterial switch operation presented with new onset heart failure symptoms.
- Echocardiogram: left ventricular dilation with severely depressed left ventricular systolic function with ejection fraction 21%.
- Electrocardiogram: normal sinus rhythm with left bundle branch block (LBBB). QRS duration was reaching 140 mseconds.
- Speckle tracking and analysis of left ventricle confirmed severe dyssynchrony.
- He underwent placement of epicardial dual chamber pacemaker with right atrial and left ventricular pacing leads.
- Significant improvement in left ventricular systolic function and symptoms and narrowing of QRS, with appropriate AV interval programming



A. Widened QRS complex with the presence of LBBB prior to CRT.  
B. Narrowing of the QRS complex with CRT  
C. Chest X-Ray with subdiaphragmatic pacemaker with leads in the right atrium and left ventricle.

## Discussion

Though originally noted to be affective particularly in adult patients with heart failure and LBBB, Cardiac Resynchronization Therapy has been found to be useful in the congenital cardiac population especially post-surgical intervention.<sup>1-3</sup> In our patient there was progressive widening of his QRS complex (60 to 140 mseconds) with LBBB. The presence of the LBBB is rare in infants and delays posterior wall contraction compared to the interventricular septum. We ruled out additional causes of left ventricular dysfunction such as coronary artery abnormalities via diagnostic cardiac catheterization. Based on the small size of the patient, we decided to resynchronize using only atrial and left ventricular leads. The left ventricular lead was placed in the posterolateral left ventricle. AV interval was programmed to allow left ventricular pacing in synchrony with right ventricle (activated by intact right bundle). Since pacemaker placement, our patient's systolic function significantly improved with left ventricular ejection fraction 54%. Resynchronization has a more favorable response in patients with LBBB, based on adult data.

## Conclusion

Cardiac Resynchronization Therapy can potentially reverse mechanical dyssynchrony resulting from electrical dyssynchrony. In pediatric and adult congenital population, this treatment method may need to be individualized based on varying structural lesions and the size of the patient. In this small infant with d-TGA status post arterial switch operation who developed severe left ventricular dysfunction and LBBB, we were able to improve the left ventricular function by single site left ventricular pacing.

## References

1. Hill AC, Silka MJ, Bar-Cohen Y. Cardiac Resynchronization Therapy in Pediatrics. J Innov Card Rhythm Manag. 2018 Aug 15;9(8):3256-3264. doi: 10.19102/icrm.2018.090804. PMID: 32477817; PMCID: PMC7252792.
2. Janoušek J, Kubuš P. Cardiac resynchronization therapy in congenital heart disease. Herzschrittmacherther Elektrophysiol. 2016 Jun;27(2):104-9. English. doi: 10.1007/s00399-016-0433-7. Epub 2016 May 25. PMID: 27225165.
3. Karpawich PP. Pediatric cardiac resynchronization pacing therapy. Curr Opin Cardiol. 2007 Mar;22(2):72-6. doi: 10.1097/HCO.0b013e328014a849. PMID: 17284983.