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MINI-FOCUS ISSUE: EP AND DEVICES

BEGINNER

CLINICAL VIGNETTE: IMAGING VIGNETTE

CardioMEMS Implantation in Patient With a Systemic Right Ventricle

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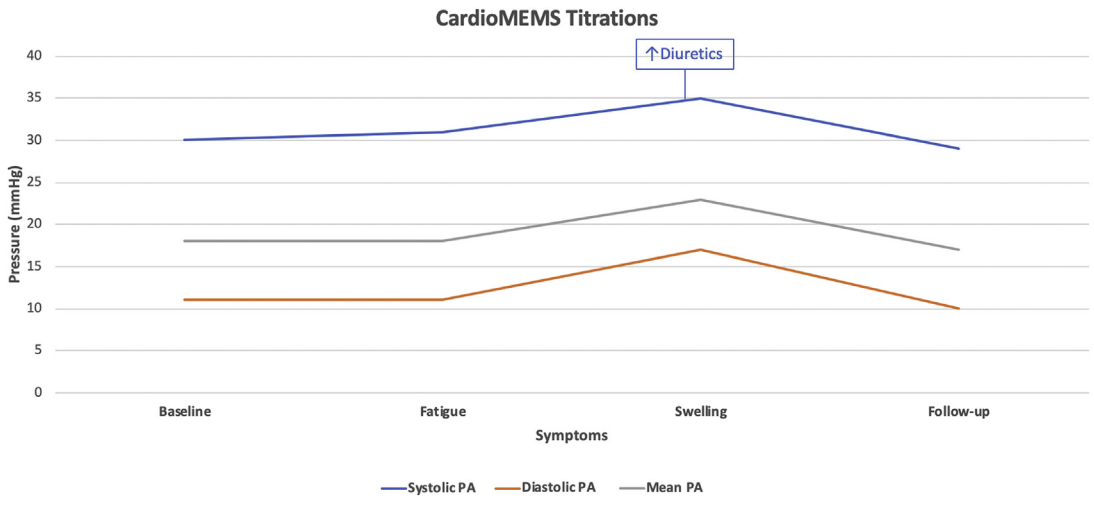
ABSTRACT

A 42-year-old woman with repaired, complex cyanotic congenital heart disease complicated by systemic right ventricular dysfunction presented for worsening heart failure. She successfully underwent CardioMEMS implantation and has since remained out of the hospital with improved functional class. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2019;1:394–5) © 2019 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

This case describes a 42-year-old woman with dextrocardia, situs inversus, congenitally corrected transposition of the great arteries, double-outlet right ventricle (I,D,D), severe subpulmonic stenosis, and a large subaortic ventricular septal defect. She underwent a Blalock-Taussig shunt in infancy with subsequent ventricular septal defect closure, valved conduit placement from the morphological left ventricle (LV) to the pulmonary artery (PA), and takedown of the Blalock-Taussig shunt at 5 years of age. In adulthood,

FIGURE 1 CardioMEMS-Guided Management



From Cardiovascular Medicine, Vanderbilt University Medical Center, Nashville, Tennessee. Drs. Zalawadiya and Menachem have served as consultants with Abbott. Dr. Lindenfeld reports a relationship with Abbott, Edwards, Boehringer Ingelheim, Relypsa, VWave, Impulse DYnamics, and CVRx. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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the patient required a 24-mm LV-to-PA conduit replacement. She presented to the clinic for evaluation of advanced heart failure (HF) therapies with New York Heart Association functional class III symptoms in the setting of hypervolemia and systemic right ventricular dysfunction with no significant tricuspid regurgitation. Her treatment was complicated by an inability to tolerate guideline-directed HF medications due to hypotension and overwhelming fatigue. Despite diuretic titration based on daily weight measurements and strict medication compliance, the patient remained symptomatic with fluctuations in weight over brief periods of time. After multiple interventions, including bilateral branch PA stenting that reduced the subpulmonic left ventricular pressure from 68% to 42% systemic, the patient continued to feel poorly. The patient lives 5 h away from our center, making frequent clinical evaluation burdensome and financially difficult. Thus, a multidisciplinary team recommended implantation of a wireless PA pressure monitoring system (CardioMEMS HF System, Abbott Medical, Inc., Abbott Park, Illinois).

ABBREVIATIONS AND ACRONYMS

CHD = congenital heart disease

HF = heart failure

LV = left ventricle

PA = pulmonary artery

Right heart catheterization was performed with a Swan-Ganz catheter passing easily through the previous right PA stent into the interlobar PA. Fluoroscopy was used to confirm the appropriate position, and multiple, small injections of contrast were made to ensure an adequately sized branch for deployment. The CardioMEMS device was successfully deployed into the left lower PA, and the Swan-Ganz catheter was used to calibrate the device. Right heart catheterization results were as follows: right atrial pressure, 9 mm Hg; subpulmonic left ventricular pressure, 41/11 mm Hg; PA, 29/10 mm Hg (18); pulmonary capillary wedge pressure, 11 mm Hg (V-wave 13 mm Hg); main PA, 69%; pulmonary vascular resistance, 1.8 Wood units; and Fick cardiac output, 3.41 l/min/CI 1.64 l/min/m^2.

The patient took 30 days of clopidogrel after implantation of the CardioMEMS system; 5 months later, she has remained euvolemic due to the utilization of PA pressure monitoring allowing remote titration of HF medications (**Figure 1**). This scenario is in comparison to the 4 office visits she required in the 5 months before the CardioMEMS insertion. Remote evaluation of her filling pressures has not only allowed for titration of diuretic agents but has helped to identify and treat symptoms unrelated to increased filling pressures.

DISCUSSION

To the authors' knowledge, this is the first reported case of a CardioMEMS device implanted in a patient with a systemic right ventricle. After the CHAMPION (CardioMEMS Heart Sensor Allows Monitoring of Pressure to Improve Outcomes in NYHA Class III Heart Failure Patients) trial, the CardioMEMS device was approved for use in patients with New York Heart Association functional class III symptoms with a hospital admission in the past year (1). Patients with congenital heart disease (CHD) were excluded from this study, despite HF being the number one cause of death in adults with CHD (2). The complicated anatomy and the paucity of data regarding best practices create treatment challenges, making utilization of continuous, invasive hemodynamic monitoring appealing. This case shows the safety, feasibility, and efficacy of CardioMEMS among patients with complex CHD. Thus far, the patient has had improved quality of life and decreased need for in-person health care evaluation.

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