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Case report

Ventricular tachycardia in the setting of a large cardiac fibroma in a pediatric patient

Jennifer O'Neal [a], Sunita Ferns [a, b, *], Weston G. Andrews [c], Michael Shillingford [a, d]

[a] Wolfson Children's Hospital, 800 Prudential Dr, Jacksonville, FL, 32207, USA
[b] Mayo Clinic Alix School of Medicine, 4500 San Pablo Rd S, Jacksonville, FL, 32224, USA
[c] University of Florida College of Medicine, 653-1 8th St W, Jacksonville, FL, 32209, USA
[d] University of Pittsburgh Medical Center, One Children's Hospital Drive, Pittsburgh, PA, 15224, USA

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ABSTRACT

Ventricular tachycardia and cardiac tumors are both extremely rare diagnoses in pediatric patients. We report a pediatric case of cardiac fibroma that was noted during the work up of ventricular tachycardia in a young patient concomitantly diagnosed with severe acute respiratory syndrome coronavirus 2.

1. Introduction

Ventricular arrhythmias though uncommon in the pediatric age group, can have devastating consequences and therefore prompt recognition and treatment is essential. Frontline providers must be able to recognize and manage these arrhythmias in the acute care setting and once the patient is stabilized, further management should involve investigations to appropriately elicit the underlying etiology. Ventricular arrhythmias in children may be noted in the setting of congenital heart defects, cardiomyopathies, drug toxicity, metabolic abnormalities or cardiac tumors [1]. While primary cardiac tumors in children are extremely rare, it is important to keep this differential diagnosis in mind in patients presenting with an arrhythmia. Surgical resection remains the standard of care for primary cardiac tumors in children [2–4]. Due to the association with sudden cardiac death, pediatric cardiac fibromas are typically resected even in asymptomatic patients [5].

We report a pediatric case of cardiac fibroma that was noted during the work up of ventricular tachycardia in a young patient concomitantly diagnosed with severe acute respiratory syndrome coronavirus 2 (SARS-CoV2).

2. Case report

A 4-year-old, previously healthy boy was noted to be tachycardic at a routine pediatrician visit. Further questioning revealed symptoms of nausea and vomiting a few days prior to presentation but was otherwise asymptomatic. A review of systems was otherwise negative. He was noted to be a healthy, well-developed child with no significant medical, surgical, hospitalization or family history. Physical examination revealed tachycardia and a hyperdynamic precordium. The rest of the exam was normal.

An electrocardiogram (ECG) in the emergency room documented wide complex tachycardia. He received three escalating doses of adenosine with no effect, followed by amiodarone (5mg/kg) intravenously with some rate but no rhythm control and therefore was sedated and electrically cardioverted to a normal sinus rhythm.

2.1. Diagnostic studies

An initial electrocardiogram (ECG) demonstrated a wide

* Corresponding author. 841 Prudential Drive - Suite 280, Jacksonville, FL, 32207, USA.
E-mail address: sjulianaferns@gmail.com (S. Ferns).
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Abbreviations

(VT)	Ventricular tachycardia
(COVID-19)	Coronavirus disease 2019
(SARS-CoV2)	Severe acute respiratory syndrome coronavirus 2
(ECG)	Electrocardiogram
(RBBB)	Right bundle branch block
(LV)	Left ventricle
(LAD)	Left anterior descending artery
(MRI)	Magnetic resonance imaging

complex tachycardia with ventriculo-atrial dissociation at 270 bpm with a right bundle branch block (RBBB) pattern, negative complexes in the inferior leads (II, III and aVF) and left sided leads (I, VL, V4-6) (Fig. 1).

A chest radiograph showed an enlarged cardiac silhouette (Fig. 2) and the patient was admitted for further management. Laboratory work was remarkable for a hemoglobin of 10.9 g/dL, brain natriuretic peptide (BNP) of 998 pg/mL, C reactive protein of 3.8 mg/dL, and a troponin of 0.21 ng/mL. The viral panel was positive for Epstein Barr Virus, Human Rhinovirus and SARS CoV2. Echocardiogram images demonstrated a left ventricular (LV) mass along the free wall of the left ventricle extending to the apex and a small pericardial as well as a right pleural effusion (Fig. 3). The mass was further delineated on a cardiac magnetic resonance imaging(MRI) scan that showed a 22× 52 mm mass with a distinct separation between the mass and the LV muscle, suggestive of fibroma. (Fig. 4).

Rhythm control was successfully achieved with propranolol at 1 mg/kg/dose q 8 hrs with no further ventricular tachycardia and only had occasional premature ventricular contractions. Serial BNP and troponin labs normalized within 72 hours of admission. Considering the positive Severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) PCR test, cardiac surgery for mass excision was postponed. He was discharged home on a 30-day, wireless cardiac event monitor that allowed for close monitoring while awaiting surgery.

Surgical excision was performed via a median sternotomy utilizing cardiopulmonary bypass with standard aortic and bi-caval cannulation. The aorta was not cross-clamped. The cardiac fibroma was excised completely and sent for a pathology exam. There were no post-excision defects that needed addressing. During the time of surgical resection, the mass was noted to have limited septal involvement, but was intimately associated with the

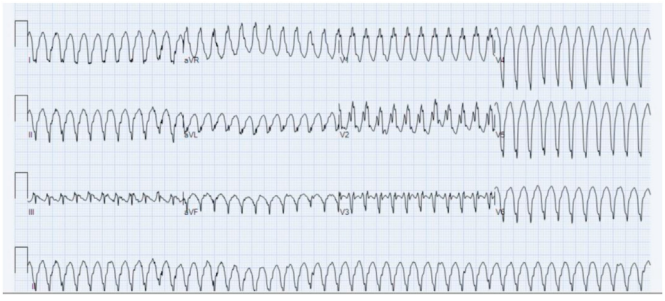

Fig. 1. Electrocardiogram at presentation shows a wide complex tachycardia with VA dissociation at 270 bpm with a RBBB pattern, negative complexes in the inferior leads (II, III and aVF) and left sided leads (I, VL, V4-6) suggesting a more apical origin near the free wall of the left ventricle.

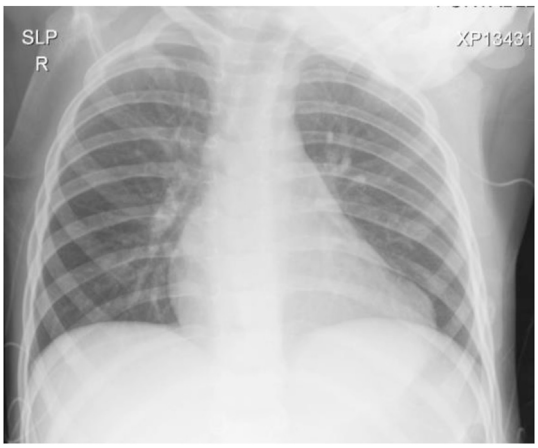

Fig. 2. Chest radiograph depicting a slightly enlarged cardiac silhouette.

distal left anterior descending artery (LAD). The LAD was carefully preserved, resulting in normal ejection fraction and no wall motion abnormalities. Histopathology on the dissected specimen demonstrated a benign cardiac fibroma with intact borders.

The patient was transferred to the pediatric cardiovascular intensive care unit. Post-operative echocardiogram demonstrated normal biventricular function with no valve regurgitation and no residual mass or effusion. He was discharged home on post-operative day 5 after an uneventful postoperative course. Propranolol was discontinued 3 months post-surgery and he continued to demonstrate no arrhythmias for beyond a year post surgery.

3. Discussion

Cardiac tumors are usually benign, and the most common pathology in the pediatric population is a rhabdomyoma, followed by fibroma, myxoma, teratoma and hemangioma. In one pediatric care consortium database review, fibromas represented 20% of pediatric cardiac tumors with mean age of presentation of 3.3 years [6].

Cardiac fibromas are a type of cardiac tumor that occur mainly in the pediatric age group and are primarily located within the left ventricular myocardium. They may develop or expand in response to inflammation and pressure effects due to these tumors on surrounding cardiac conduction may results in arrhythmias and sudden death [3–5]. These tumors therefore require prompt surgical attention as even asymptomatic patients may become rapidly symptomatic secondary to embolism or arrhythmias [7,8]. Due to their location in the LV myocardium these tumors can also exert pressure on coronary arteries and valve tissue leading to ischemia and valve regurgitation [7]. Fibromas are unencapsulated and surgery should be offered early as they grow fast and can invade the myocardium [8]. Surgical treatment is considered relatively safe, with low intra-operative and post-operative morbidity and mortality rates [2,9]. Miyake et al. reported that, compared to other tumors of the heart, fibromas were more likely to present with clinically significant arrhythmias and may be associated with arrhythmias in up to 10% of patients [10]. Bradyarrhythmia's such as atrioventricular or ventricular conduction disturbances may also occur [3,5,10]. Clinical presentation may be determined by the rate of growth, location, and size of the tumor. An initial chest radiograph, may reveal altered contour of the heart and cardiomegaly as was noted in our patient [2]. Echocardiography and magnetic resonance imaging are the gold standard for diagnosing cardiac tumors though computed tomography can be a useful adjunct [2,3].

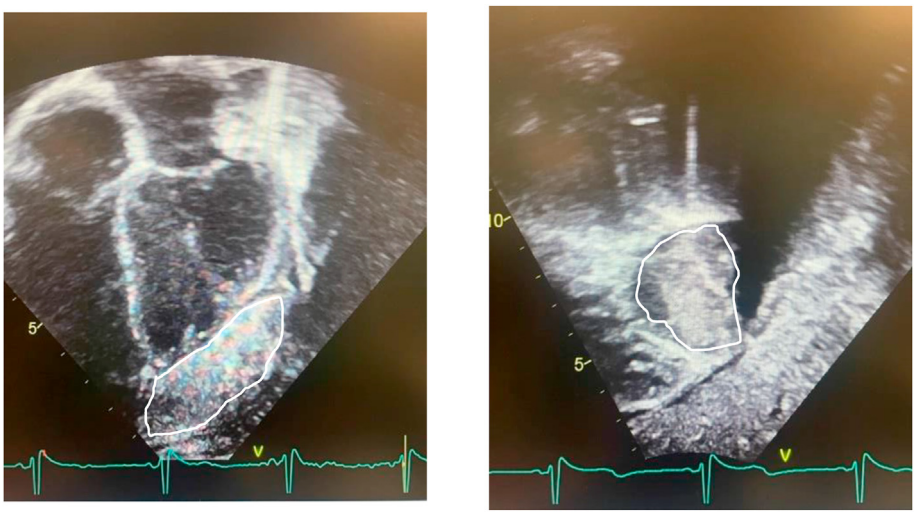

Fig. 3. a,b: Echocardiography with a parasternal long axis view and of left ventricular free wall fibroma(fibroma outlined in white).

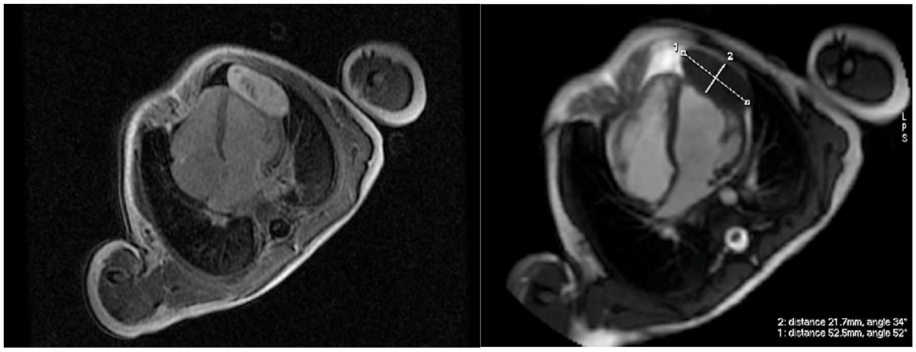

Fig. 4. Cardiac magnetic resonance imaging depicting a left ventricular free wall fibroma.

Young children may appear relatively asymptomatic, despite an active arrhythmia and this child's presentation with an incidental detection of tachycardia is not unusual. This patient was successfully stabilized with cardioversion and managed medically while he was evaluated for surgical resection and recovered from his COVID infection. Echocardiography and MRI allowed for the tumor margins and architecture to be assessed allowing for comprehensive surgical planning. The complexity of this patient was increased by the concurrent diagnosis of COVID-19, especially as timing was early in the course of the pandemic. At the time of the patient's presentation, vaccinations were not available, and most facilities were delaying non-urgent procedures as part of hospital protocols. The patient remained free of COVID19 significant symptoms, however the intercurrent infection delayed surgical intervention. Cardiac fibromas are known to expand in response to inflammation and it is possible that the intercurrent viral illness may have led to a precipitation of the tachyarrhythmia.

Once diagnosed with COVID-19, an alternative plan needed to be fashioned to ensure patient safety including delay of definitive treatment with careful monitoring. There are no consensus guidelines for triaging this unique patient [11]. The care team prioritized the immediate risk to his life; the arrhythmia secondary to the cardiac fibroma. Once stable on medical management, the child was sent home to recover from his COVID-19 infection with real time telemetry monitoring. The patient returned three weeks later with a negative test for COVID-19 and underwent an uneventful surgical resection and a complete recovery.

Follow-up: The patient has no further arrhythmias or clinical sequalae noted close to two years post-surgery.

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None.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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