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Case Report

Pectus excavatum: a cause of serious cardiac dysfunction and dysrhythmia☆,☆☆

Abstract

A 24-year-old woman presented to the emergency department (ED) with new onset of palpitations. The patient was found to have pectus excavatum on examination and atrial fibrillation with rapid ventricular response and a right bundle branch block on electrocardiogram; she underwent synchronized cardioversion, which restored normal sinus rhythm. All laboratories were negative. Transthoracic echocardiogram and cardiac magnetic resonance imaging revealed that the sternum was compressing the right ventricular wall causing a decreased right ventricular ejection fraction. Right atrial enlargement and pulmonary hypertension were also noted. Based on a markedly abnormal thoracic width-to-depth ratio (the Haller index), the patient was referred for operative repair and genetic testing for connective tissue disease was recommended. Pectus excavatum is a common occurrence in emergency practice, occurring in approximately 1 in 300 individuals. Although it is generally dismissed as a benign condition, our case demonstrates that it may cause significant and even life-threatening cardiac complications. Direct compression of the right ventricular free wall by the chest wall in this case led to tricuspid regurgitation with right atrial enlargement, causing the atrial fibrillation, which prompted the ED visit. This is but one of the many complications that can arise from pectus excavatum. Emergency clinicians should be aware of the spectrum of cardiac physiologic and conduction abnormalities that this often overlooked condition may cause.

A 24-year-old African American woman presented to the emergency department with chief complaint of intermittent palpitations for 1 day. The patient initially noted palpitations the night before presentation that resolved spontaneously. On the day of presentation, the patient woke up with palpitations she described as an irregular and rapid heartbeat. The patient denied chest pain, shortness of breath, fever, or cough. The history was negative for cardiac or thyroid disorder; and she denied drug, alcohol, or caffeine use. Examination was positive only for a rapid irregular pulse and a prominent pectus excatavum, which the patient related had been present since birth; a high arched palate and long limbs and digits were also noted. The electrocardiogram revealed atrial fibrillation with a rapid ventricular response of 152 beats per minute and a right bundle branch block. Laboratory investigations, including metabolic panel and thyrotropin were within normal limits. Chest x-ray was read as "clear lungs, borderline cardiomegaly, and pectus deformity of anterior chest wall."

Synchronized cardioversion at 200 watt seconds resulted in the prompt restoration of normal sinus rhythm at 94 beats per minute with a right bundle branch block; biatrial enlargement was also present. The patient was discharged home asymptomatic, with a referral to a cardiologist specializing in electrophysiologic studies. The patient was admitted to the hospital when she returned 4 hours later complaining of palpitations and anxiety. There was no evidence of recurrent arrhythmia, and the examination was unchanged. Transthoracic echocardiogram revealed normal right ventricular size and function but with extrinsic compression of right ventricular free wall, a dilated right atrium, redundant tricuspid valve leaflets, moderate tricuspid regurgitation, and pulmonary hypertension. Normal left ventricular size and systolic function were noted. Cardiac magnetic resonance imaging revealed pectus excavatum compressing the right ventricle free wall and outflow tract below the level of the pulmonic valve, with associated depressed right ventricular ejection fraction of 35% (see Fig. 1). Moderate tricuspid regurgitation was present. The patient remained in normal sinus rhythm and was discharged with a referral for surgical correction of the anatomic abnormality as well as consideration for genetic testing for connective tissue disorders.

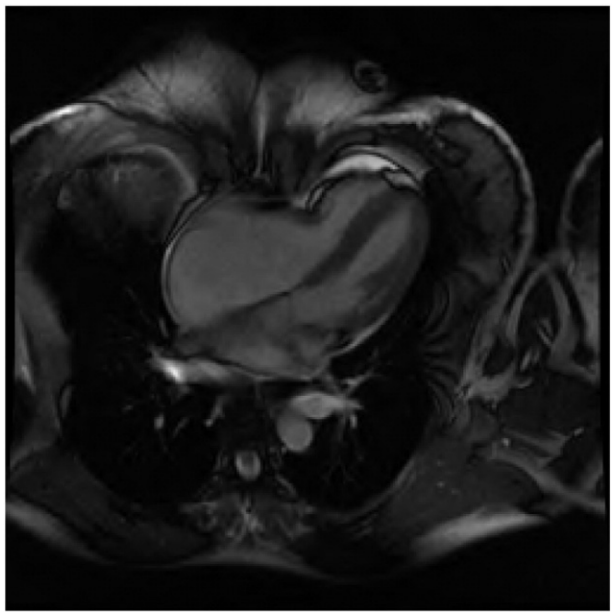

Fig. 1. Magnetic resonance imaging demonstrating compression of the right ventricle.

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☆☆ No reprints.

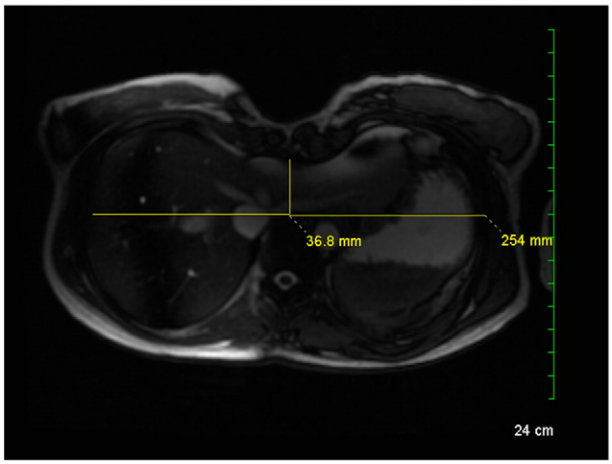

Fig. 2. Demonstrating an abnormal thoracic width-to-depth ratio (Haller index).

Although pectus excavatum is observed commonly in emergency practice (it occurs in ~1 in 300 patients with a male predominance) [1], it is usually thought of a benign anatomic abnormality. It is often associated with connective tissue syndromes such as Marfan and Ehlers-Danlos but is usually of no pathologic importance [2]. As our case demonstrates, however, pectus excatavum is associated with a number of cardiac complications, some of which may prove life threatening [3,4]. Direct compression of the right ventricular wall, such as seen in our case, may result in tricuspid regurgitation with right atrial enlargement leading to atrial fibrillation as the presenting complaint. The precise site of compression can lead to various different types of complications, including right ventricular hypertrophy and many types of conduction abnormalities, including first- or second-degree heart block and bundle branch block such as we observed. Although the mechanism is unclear, pectus excavatum is also associated with Wolf-Parkinson-White syndrome and several variants of the Brugada syndrome [5,6].

There are 2 major surgical approaches for repair of symptomatic pectus excavatum. The older and more invasive Ravitch procedure involves insertion of a bar underneath the sternum and division of the costal cartilages. The less invasive Nuss procedure also uses surgical implants but avoids major chest wall surgery. Candidacy for surgical intervention is determined by the degree of physiologic impairment as well as the ratio of the chest's transverse diameter to the anteroposterior diameter (the Haller index) [7]. The normal Haller index is 2.5; patients with pectus excavatum exhibit a Haller index of above 3.25. Our patient's Haller index was more than twice than that (see Fig. 2).

Terry Li, MD
Evan Bishop-Rimmer, MD
Mason Shieh, MD
Paul Kreiger, MD
Marc Felberbaum, MD
Michael Heller, MD*
Mount Sinai Beth Israel Medical Center, New York, NY
*Corresponding author. Tel.: +1 610 216 2919
E-mail address: heller.michael@yahoo.com

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