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CASE REPORT

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An uncommon cause for mitralization of the heart: Graves' disease

Vinuta Mohan* **and Tarig Mabrouk**

Saint Francis Medical Center, Trenton NJ, USA

Introduction

When the structures forming the left heart border on chest x-ray appear to be in a straight line that is described as "mitralization" of the heart. Most patients with this radiographic finding have moderate to severe mitral valve disease. Patients with hyperthyroidism secondary to Graves' disease may undergo many changes of their cardiovascular systems. While some of these effects are due to the hemodynamic burden of a hyperdynamic circulation, other effects are due to dysfunction of valvular structures. Usually these changes revert back to normal once the hyperthyroidism is resolved. Here we describe a patient with no known previous cardiac or thyroid disease who presents with new onset Graves' disease and mitralization of the heart.

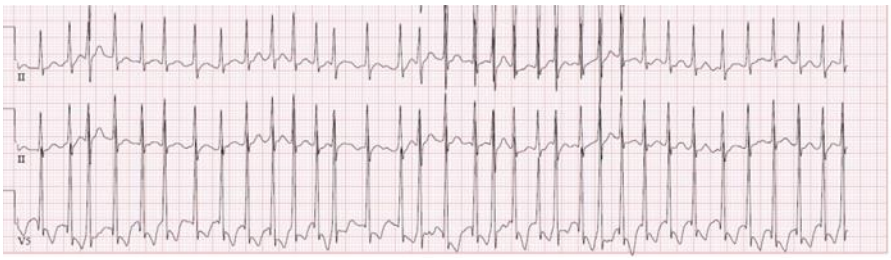

Figure 1. EKG consistent with rapid atrial fibrillation.

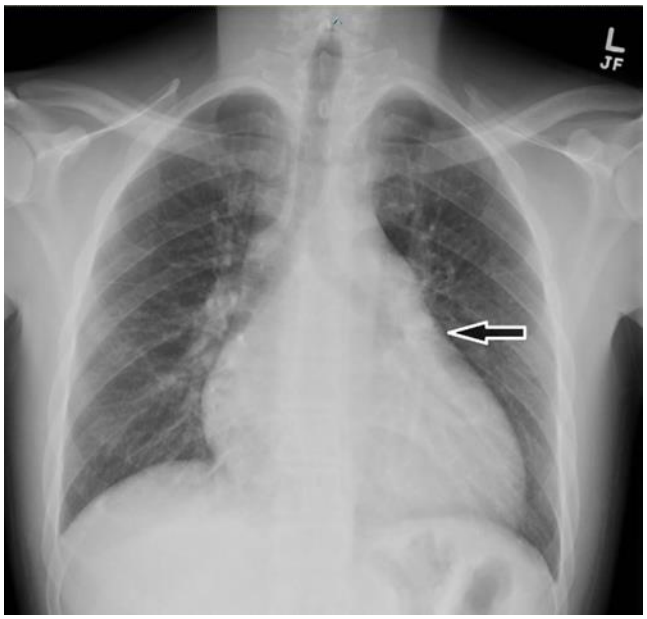

Figure 2. Chest X-ray showing straightening (mitralization) of the left heart border.

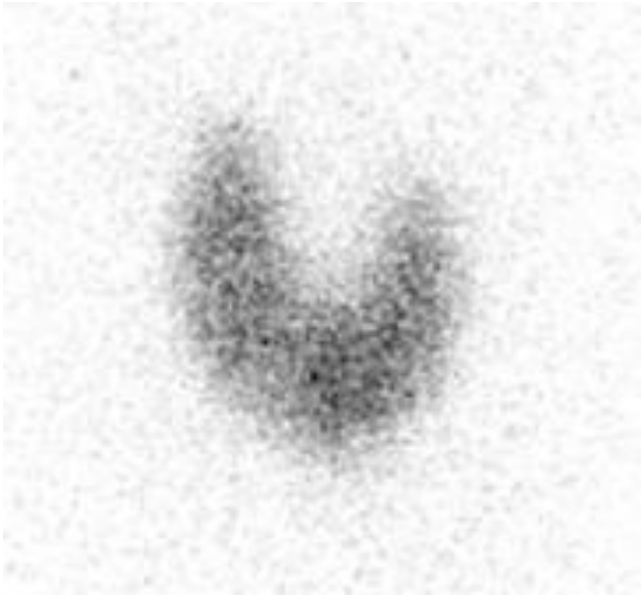

Figure 3. Thyroid uptake and scan consistent with Grave's disease.

Case Presentation

A 24 year old African American male presented to our emergency room with new onset palpitations for 2 weeks. He had no significant past medical, family or surgical history. He denied tobacco, alcohol or drug use. He denied the use of over the counter or prescription medications.

His initial blood pressure was 143/94 mm Hg. He was afebrile and his respiration rate was 14, but he appeard anxious and slightly tremulous. Physical exam was remarkable for bilateral exophthalmos and his thyroid was diffusely enlarged. Cardiac exam was remarkable for an extremely rapid and irregularly irregular rhythm.

His EKG revealed atrial fibrillation with a rapid ventricular rate of 194 bpm (Figure 1) and his chest X-ray showed mitralization of the left heart border (Figure 2). His transthoracic echocardiogram (TTE) revealed normal atrium and ventricle sizes with a mildly decreased ejection fraction of 45-50%. Severe mitral regurgitation and tricuspid regurgitation were present. Labs revealed TSH <0.01 uIU/mL (0.3-4.2), free thyroxine (T4) >7.77 ng/dL (0.93-1.7), and free triiodothyroine (T3) 19.3 pg/ml (2.3-4.2). His electrolytes and CBC were within normal limits.

Intravenous diltiazem was started and he spontaneously reverted to normal sinus rhythm. Thyroid uptake and scan revealed homogeneous, elevated uptake at 76% consistent with Graves' disease (Figure 3). He was started on atenolol 12.5mg twice a day and remained in normal sinus rhythm. He underwent iodine ablation as an outpatient, became hypothyroid, and started levothyroxine therapy. He remained euthyroid with no further cardiac events.

Discussion and conclusion

Mitralization of the heart is a unique radiographic finding on chest x-ray. It is described when the structures forming the left heart border, the aortic knob, pulmonary artery, left ventricle and left atrium align in a straight line. This gives the impression of straightening of the left heart border on chest x-ray, or "mitralization" of the heart. It can be found in patients who have left atrial enlargement secondary to chronic, acquired conditions such mitral valve stenosis or mitral valve regurgitation. It may also be seen in patients with ventral septal defect, patent ductus arteriosus and rarely in patients with left atrial myxoma, papillary muscle wall dysfunction and chronic congestive heart failure [1].

Graves' disease is a metabolic disorder resulting in a hyperdynamic circulatory state. These patients have an increase in total blood volume and cardiac contractility, as well as a decrease in systemic vascular resistance, all which increase cardiac output. Graves' disease patients can experience cardiovascular abnormalities such as arrhythmias, heart failure, pulmonary hypertension as well as mitral and tricuspid regurgitation as our patient had. Fortunately, most of these abnormalities resolve once the hyperthyroidism is treated [2].

Our patient was young and recently diagnosed with hyperthyroidism. His echocardiogram did not show left atrial enlargement, only valvular dysfunction, yet his chest x-ray was consistent with mitralization of the heart. He likely had mild heart failure given his decreased ejection fraction. However, his heart failure was not severe enough to cause appreciable dilation of his left atrium or left ventricle on TTE. To our knowledge, this is the first report demonstrating this unique radiographic finding in a patient with Graves' disease as the underlying cause. Although the exact cause is unknown, we speculate this radiographic finding in our patient was due to the transient, hyperdynamic circulatory state and valvular disease patients with Graves' disease can experience.

Learning points

1. Mitralization of the heart is a unique radiographic finding, commonly associated with left atrial enlargement (LAE) secondary to mitral valve disease.
2. Graves' disease is often associated with transient cardiovascular disease and can cause mitralization of the heart on chest x-ray, despite no significant left atrium dilatation.

References

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Correspondence: Sara Mai, Department of Dermatology, Ibn Sina University Hospital, Rabat, Morocco, Tel: +212625104836; E-mail: sara250190@gmail.com

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