Short Communication

Pseudoischemic Electrocardiogram in Myasthenia Gravis with Thymoma: Reversibility After Thymectomy

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ABSTRACT

Abnormal ST T-wave changes can be found at presentation in various noncoronary disorders; misinterpretation of these patterns as ischemic heart disease can lead to erroneous diagnosis and treatment. Here we present a case of myasthenia gravis (MG) with thymoma, in which the resting electrocardiogram (ECG) led to a misleading diagnosis of myocardial ischemia. After thymectomy, the ECG resumed a normal pattern. Myasthenia gravis is not usually considered in the differential diagnosis of conditions associated with an abnormal ECG. The combination of dysphagia, dyspnoea, ECG changes, and creatine kinase (CK) elevations may easily bring to mind an erroneous and possibly deleterious diagnosis of myocardial ischemia.

Introduction

The resting 12-lead electrocardiogram (ECG) remains at the center of the diagnostic pathways of acute coronary syndromes (ACSs), either with[1] or without ST segment elevation,[2] because it serves as an invaluable tool for both diagnosis and risk stratification. Nevertheless, as is universally accepted, the predictive value of any diagnostic procedure always relies upon the pretest probability, which in turn depends on the level of clinical suspicion. Here we present a case of myasthenia gravis (MG) with thymoma, in which the resting ECG led to a misleading diagnosis of myocardial ischemia.

Case Report

A 36-year-old man presented to the emergency department (ED) because of dysphagia and dyspnoea that had begun shortly after an upper respiratory tract infection. As the initial ECG showed sinus tachycardia with inverted T-waves on leads I, aVL, and V3—V6, and a pseudoinfarction aspect of the ST segment on the anterior leads (Figure 1A), the patient was transferred to our department for further evaluation.

His past medical history included adenoidectomy and appendectomy; both remote. He did not report a familial history of coronary artery disease (CAD). He was not smoking at the time of admission, nor had been a smoker previously, and he did not have a history of diabetes mellitus, hypercholesterolemia, or hypertension. He did not take any drugs, and he did not report drinking alcohol; he denied using cocaine. He had been well until 2 y prior, when he began to report asthenia and palpebral ptosis; however, he did not seek medical attention. At the beginning of the current year, he reported a flu-like illness, with spontaneous recovery, but shortly afterward he experienced dyspnea, dysphagia, and weight loss (37 kg). One month before admission, he underwent fiberoptic endoscopy of the nose, pharynx, and larynx because of dysphonia, without any evidence of an active disease.

At admission, the patient appeared quite well, not reporting chest pain; his heart rate was 120 beats/min without cardiac murmurs, blood pressure was 130/70 mm Hg, and respirations were 18 breaths/min. Lungs were clear. Another ECG (not shown) was unchanged. Blood gases were within reference ranges. The relevant blood tests conducted are shown in Table 1. Chest X-rays did not reveal any abnormality. On ultrasound studies, the heart showed no areas of hypokinesia and normal left ventricular systolic function; the spleen appeared enlarged (bipolar diameter, 152 mm). A grade A reflux oesophagitis was diagnosed by endoscopy.

A computed tomography (CT) scan of the thorax was then performed (Figure 1B, arrows), which revealed the presence of a round mass at the level of the anterior mediastinum. The mass had a solid-tissue appearance with contrast enhancement and a diameter of 55 mm. As the suspicion of MG with thymoma was high at this point, we performed a Desmedt test, which gave a positive result. Follow-up ECGs showed sinus rhythm with unchanged repolarization abnormalities.

The patient was then referred to the cardiothoracic unit where he underwent a sternotomy and maximal thymectomy (Figure 1C). At histological examination, the tumor

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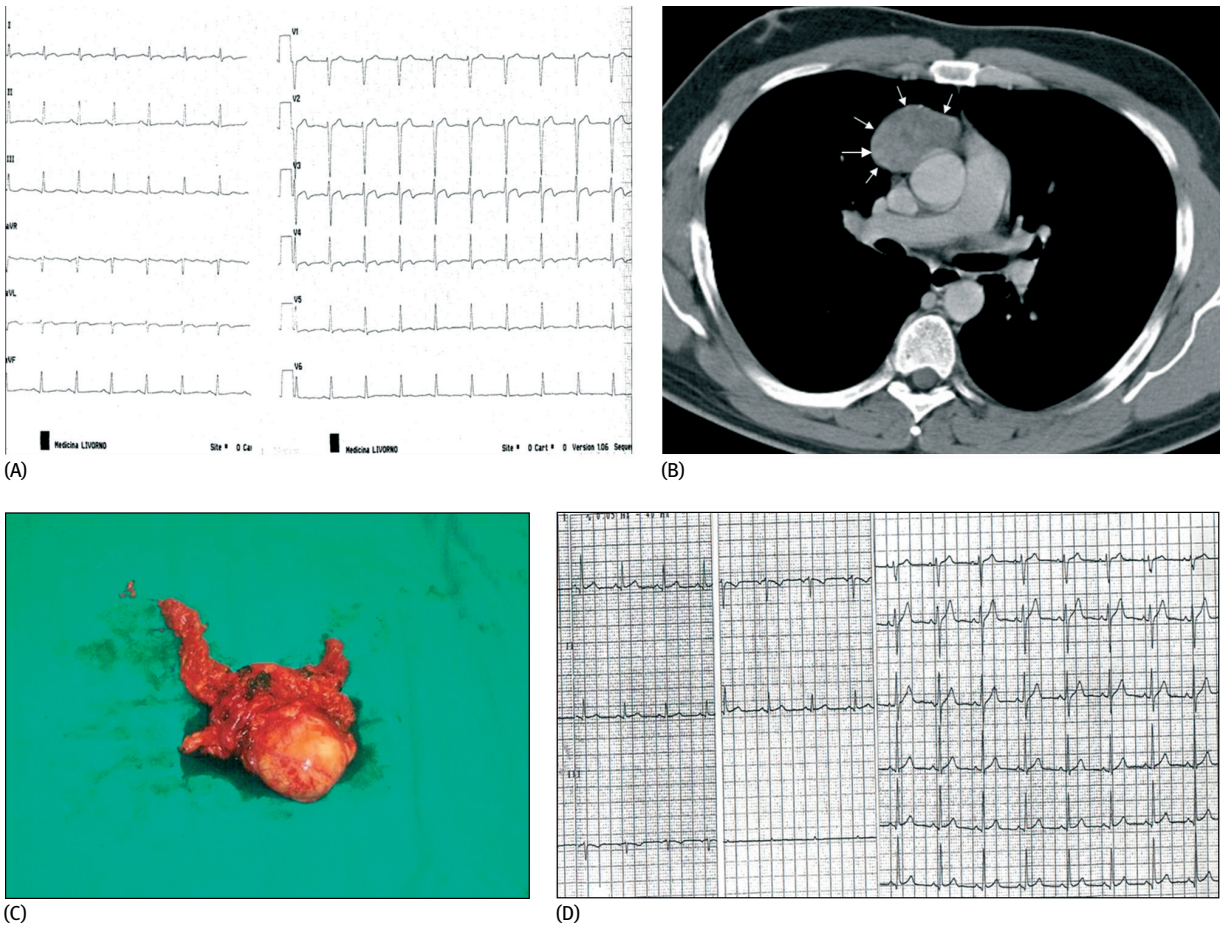

Figure 1. (A) Initial ECG showed sinus tachycardia with inverted T-waves on leads I, aVL, V3 — V6, and a pseudoinfarction aspect of the ST segment on the anterior leads; cQT was 0,377. msec. (B) A CT scan of the thorax (arrows) revealed the presence of a round mass at the level of the anterior mediastinum. (C) The tumor after sternotomy and maximal thymectomy. (D) The ECG, performed at 9 mo, showed a completely normal pattern; cQT was 0,361 msec (cQT denotes the heart rate corrected QT interval).

was morphologically compatible with fibrosclerotic thymoma (type AB); immunophenotyping showed positivity for creatine kinase (CK)-PAN, CD20, and CD3 antigens. Before and after the surgery, the patient was treated with anticholinesterase drugs, steroids, immunosuppressors, intravenous immunoglobulins, and plasmapheresis. Symptoms and signs of the disease subsequently resolved. After a follow-up at 9 mo, the patient was free from chest pain and palpitations; the ECG revealed a completely normal pattern (Figure 1D).

Discussion and Literature Review

Although ST changes are usually considered to indicate acute myocardial ischemia or infarction, symmetrical precordial T-wave inversion is known to predict acute ischemia as well, because of stenosis of the left anterior descending coronary artery.[3]

Accordingly, when new, or presumably new, T-wave inversions are discovered in a patient with symptoms, the likelihood that such symptoms could represent an ACS secondary to CAD should be regarded as high, even if the patient had any classical risk factors, other than being of the male sex, for unstable angina.[4]

Unexplained dyspnoea, epigastric discomfort, and fatigue are well-known anginal equivalents.[2] Furthermore, hypokinesis of the anterior wall associated with this ECG pattern could identify a group of patients at high risk with medical treatment.[5] Myasthenia gravis is a rare disorder that is not usually considered in the differential diagnosis of either ST elevation myocardial infarction (STEMI) or unstable angina/non-STEMI[1,2]; however, the disease may present with ECG changes and left ventricular wall motion abnormalities. The involvement of the heart in MG has been reviewed beginning in the 1970s, including the association

Table 1. Relevant blood tests at admission and on subsequent days

Test	Value	Reference range
Hemoglobin, g/dL	15.1	13.0–17.0
AST, IU/L	47	9–37
Creatine, mg/dL	0.95	0.70–1.20
CK, IU/L	640	24–195
Myoglobin, ng/mL	337	15.2–91.2
cTnI	0.06	<0.06
TSH, μUI/mL	1.92	0.40–4.0
TG Ab	<20	
TPO Ab	<10	
ANA	Negative	Negative

Abbreviations: CK = creatine kinase.

between malignant thymoma and the more severe form of the myocardial disease.[6] Electrocardiographic abnormalities were detected in the early studies with variable percentages, ranging from 8.3% for nonspecific T-wave changes to 44.1% for QT prolongation.[7,8] More recently, Asensio et al.[9] conducted a retrospective analysis of ECGs from 117 patients with MG and reported unspecific changes, mainly T-wave alternans, to be present in 58.1% of cases. While a pathologic ECG tracing suggests heart disease as the first hypothesis, a true cardiac involvement in MG remains to be definitively ascertained.

Since there is no neuromuscular plate in the heart,[10] the importance of autonomic nervous system involvement in MG has been postulated.[6] On the other hand, some cases of heart disease in MG has been unequivocally linked to giant cell myocarditis[11–14] and to transient dysfunction of ventricular motility, or tako-tsubo cardiomyopathy.[15,16] Although no defined etiology exists for tako-tsubo cardiomyopathy, it has been associated with variable factors, including stress, inducing an elevation in catecholamines. In both the reported cases, the syndrome was time-related to plasmapheresis, a stressful procedure. In our case, the patient did not undergo apheresis, and none of the features of tako-tsubo cardiomiopathy were present. Associations with other autoimmune disorders, such as Hashimoto thyroiditis[12] or striated muscle myositis,[13,14] have been reported. As we have not performed a muscle or myocardial biopsy, we can only speculate on serum levels of myoglobin, CK, and troponin I. The pattern in our case is suggestive of myositis but not with myocarditis. Finally, patients with an already known MG could present in the ED with ECG patterns of angina[17] or even infarction[18] due to the vasospastic effect of anticholinesterase medications.

Although it was previously noted that ECG tracings showed no tendency to change under the effect of the therapy,[7] the evolution of ECG abnormalities and their prognostic importance represent 2 neglected areas of uncertainty for which prospective studies are certainly needed. Our case is, to the best of our knowledge, the first to clearly demonstrate that a comprehensive and aggressive approach (including surgery when thymoma is present) to this disease could result in complete normalization of ECG abnormalities.

Conclusions

Myasthenia gravis is a rare disease that it is not usually considered in the differential diagnosis of abnormal ST T-wave changes, although the combination of dysphagia, dyspnea, ECG changes, and CK elevations may lead to an erroneous and possibly deleterious, misdiagnosis of myocardial ischemia. We hope that this case may be helpful in reminding busy ED physicians of the importance of getting a secondary interpretation of the ECG.

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