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Isolated Right Atrial Enhancement with Atrial Standstill: An Uncommon Presentation of Emery–Dreifuss Muscular Dystrophy

Basavaraj Biradar[1] Jineesh Valakkada[2] Anoop Ayyappan[1] Ajay Alex[1]

[1] Department of Imaging Sciences and Interventional Radiology, Sree Chitra Institute of Medical Sciences, Trivandrum, Kerala, India
[2] Department of Gastrointestinal Radiology, Sree Chitra Institute of Medical Sciences, Trivandrum, Kerala, India

Address for correspondence Jineesh Valakkada, MD, Sree Chitra Institute of Medical Sciences, Trivandrum 673011, Kerala, India (e-mail: jineesh174@gmail.com).

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Abstract

Emery–Dreifuss muscular dystrophy (EDMD) is a rare inherited syndrome that affects muscles, joints, and the heart. The classic clinical triad includes early joint contractures, slowly progressive muscle weakness, and cardiac abnormalities. The common cardiac manifestations include conduction disturbances, systolic dysfunction, and dilated cardiomyopathy and may be associated with left ventricular noncompaction with an increased risk of thromboembolic events. Conduction disturbances include atrial arrhythmias, atrial standstill, complete heart block, or ventricular tachyarrhythmia. Cardiac magnetic resonance imaging (CMR) can help in the diagnosis of this condition by identifying chamber dilatation, systolic dysfunction, and late gadolinium enhancement of the atrium. Additional MRI finding of paraspinal muscle atrophy, an important finding in this muscular dystrophy, helped in reaching a confident imaging diagnosis. Our case in this article highlights the clinical and CMR findings of this rare condition.

Keywords
- cardiac MR
- atrial dilatation
- stroke
- muscular atrophy

Introduction

Emery–Dreifuss muscular dystrophy (EDMD), also called humeroperoneal muscular dystrophy, is a rare inherited syndrome that affects muscles, joints, and the heart.[1] The classic clinical triad of EDMD includes early joint contractures, slowly progressive muscle weakness, and cardiac abnormalities. Cardiac involvement usually follows muscle phenotypes and commonly presents with rhythm abnormalities. Here we present a case of EDMD in a middle-age patient who presented with atrial scar with cardioembolic stroke, highlighting the clinical and cardiac magnetic resonance imaging (MRI) features seen in this rare entity.

Case Report

A 35-year-old gentleman presented with acute onset right hemiparesis. MRI of the brain revealed acute infarcts in the left basal ganglia and insula. Acute stroke was managed conservatively as he presented beyond window period for mechanical thrombectomy. The two-dimensional (2D) echocardiography during admission revealed right atrial (RA) enlargement and tricuspid regurgitation. Clinical examination showed wasting of biceps muscle and normal neck flexion with weak extension. The lower limb examination revealed weak hip extensors and adductors, hamstrings weaker than quadriceps, and ankle dorsiflexion weaker

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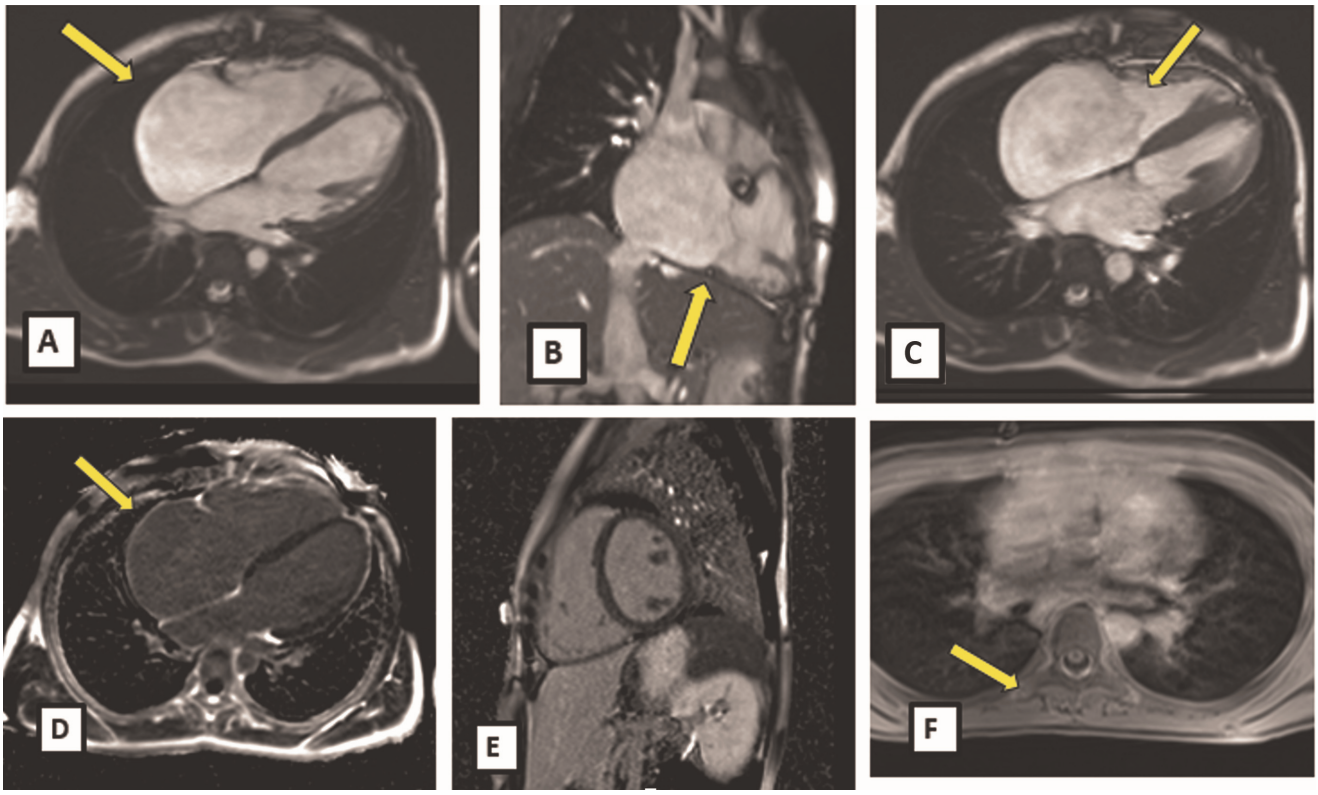

Fig. 1 Cardiac magnetic resonance imaging cine balanced steady-state free precession four- and two-chamber images show severely dilated RA (area measures 53 cm^2). left atrium (LA), left ventricle (LV), and right ventricle (RV) show normal dimensions. The tricuspid leaflets show (**A, B**) normal attachment with (**C**) mild tricuspid regurgitation. (**D**) Late gadolinium enhancement shows enhancement of the RA walls with (**E**) no enhancement in the RV or LV myocardium. Postcontrast three-dimensional volumetric interpolated breath-hold examination images show atrophy of the bilateral paraspinal muscles in the thoracic spine.

than plantar flexion. He had elevated serum creatine phosphokinase levels (1,259 U/L). Electrocardiogram (ECG) demonstrated junctional escape rhythm with a heart rate of 50 and atrial standstill. On 24-hour Holter study, sinus bradycardia was seen with no atrial fibrillation and ventricular or supraventricular ectopic burden of less than 1%.

Cardiac MRI (CMR) revealed severe dilatation of the right atrium (85 mm) and mildly dilated left atrium (55 mm). Both ventricles showed preserved wall thickness with mildly compromised biventricular systolic function (left ventricular ejection fraction of 56% and right ventricular ejection fraction of 59%). Late gadolinium enhancement (LGE) was noted in dilated RA walls suggestive of fibrosis (►**Fig. 1**). No LGE was seen in the ventricular walls. There was atrophy of cervical and thoracic paraspinal muscles, an important finding that helped in narrowing down the diagnosis to muscular dystrophy, which was evident from clinical examination. Muscle biopsy was deferred as the patient was on oral anticoagulants for stroke. Genetic test using clinical exome sequencing confirmed EDMD.

Discussion

EDMD is a rare muscular dystrophy with a prevalence of 0.39 to 1 per 100,000.[2] The classic clinical triad includes early joint contractures, slowly progressive muscle weakness and atrophy, and cardiac abnormalities. EDMD can be inherited as an X-linked recessive, autosomal recessive, or autosomal dominant disease, the latter being the most common disease. The genetic spectrum of EDMD includes mutations in EMD, LMNA, SYNE1, SYNE2, FHL1, TMEM43, SUN1, SUN2, and TTN genes,[3] which encode for the nuclear envelope proteins and hence is termed "nuclear envelopathies." Mutations in LMNA and EMD are the most common causes of EDMD, together accounting for approximately 36% of cases.[3] Thus, for EDMD, there are still several undetected causative genes.

The onset of EDMD is usually during childhood and the clinical course is usually benign. In general, joint contractures (elbows, neck, ankles, and spine) appear during the first two decades, followed by muscle weakness and wasting (typically humeroperoneal muscle). Cardiac involvement usually presents after the second decade of life[4,5] with rhythm disturbances including atrial arrhythmias, atrioventricular blocks, and atrial standstill.[6] Systolic dysfunction and dilated cardiomyopathy are found in a minority of patients with autosomal dominant EDMD due to LMNA mutations.[7] Syncope and sudden cardiac death (SCD) caused by complete heart block or ventricular tachyarrhythmia are dreaded complications.[7,8] Association between left ventricular noncompaction and an increased risk of thromboembolic events is also described.[9]

Creatine kinase levels in EDMD patients can range from normal to 15 times the upper limit, without direct correlation with muscular or cardiac involvement.[10] Muscle MRI

findings typically show atrophy with fatty infiltration involving paravertebral, peroneus, gluteal, quadriceps, biceps, semitendinosus, semimembranosus, adductor major, soleus, and gastrocnemius muscles.[11]

Data regarding CMR findings in EDMD are limited due to the rarity of the disease and the frequent requirement of pacemakers in these patients. CMR findings include atrial dilatation, which explains the occurrence of supraventricular tachycardias, atrial fibrillation, and atrial flutter in these young patients. Dilated left ventricle (LV) with systolic dysfunction and LV noncompaction are other CMR findings. The LGE in dilated atrial walls and mid-myocardial LGE in basal interventricular septum may indicate fibrosis.[12] Other differentials for isolated dilated right atrium include SCN mutation and isolated RA aneurysm. CMR is a supportive modality, as skeletal findings are the predominant phenotype of EDMD.

There is no specific treatment for EDMD. Physical therapy and surgery may be used to release contractures as needed. In view of the high risk of SCD, implantation of pacemaker or implantable cardioverter defibrillator for symptomatic bradyarrhythmia or other conduction abnormalities is essential.[4,13] Standard heart failure therapy for complicated dilated cardiomyopathy is recommended. Anticoagulants should be used for thromboembolic prophylaxis in patients affected by atrial fibrillation/flutter or standstill.[6] Surveillance involves annual monitoring for arrhythmias with 24-hour ECG and evaluation of the dilatation progress with transthoracic echocardiogram. Due to risk of SCD, cardiac screening of individuals with EDMD and first-degree relatives is recommended.[14]

To conclude, isolated atrial enhancement with atrophy of the paraspinal muscles on CMR can be a marker of EDMD.

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None.

Conflict of Interest
None declared.

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