

Marfan's Syndrome: Pre-pubertal Aortic Rupture with Left Coronary Artery Aneurysms and Fistulas

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ABSTRACT

Aortic dissection and rupture occur in 20–40% of patients with Marfan's syndrome. This occurs predominantly in the third and fourth decade of life, contributing to the increased morbidity and mortality of this specific group of patients. This is the first known documented case report of pre-pubertal left coronary sinus rupture with left coronary artery aneurysms with fistulous communication to both the superior vena cava and right superior pulmonary vein, presenting with a continuous murmur.

Keywords: Aortic dissection, coronary artery fistula, Ghent criteria, Marfan's syndrome

Síndrome de Marfan: Ruptura Aórtica Prepubertal con Fístulas y Aneurismas de la Arteria Coronaria Izquierda

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RESUMEN

La disección y ruptura aórticas ocurren en 20–40% de los pacientes con el síndrome de Marfan. Esto ocurre predominantemente en la tercera y cuarta décadas de la vida, contribuyendo al aumento de la morbilidad y la mortalidad de este grupo específico de pacientes. Éste es el primer reporte de un caso documentado conocido de ruptura prepubertal del seno coronario izquierdo con aneurisma de la arteria coronaria izquierda, y comunicación fistulosa tanto con la vena cava superior como con la vena pulmonar superior derecha, acompañada de un soplo continuo.

Palabras claves: Disección aórtica, fistula de la arteria coronaria, criterios de Ghent, síndrome de Marfan

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INTRODUCTION

Marfan's syndrome, first described by Antoine Marfan, a French paediatrician, in 1896, is a variable autosomal dominant condition which in 1991 was identified as a mutation in the gene encoding for fibrillin-1 (FBNI) on chromosome 15 seen in 66 to 91% of cases. There are documented cases of new mutations which occur in up to 27% of Marfan's syndrome in transforming growth factor b-receptor 2 (TGFB2) on chromosome 9, TGFB1 gene on chromosome 3 and 10481le-Thr noted in the literature in two cases of neonatal Marfan's Syndrome. Marfan's syndrome is a connective tissue disorder with multiple clinical features affecting every system consisting of fibrillin-1, which is in

elastic and non-elastic connective tissue (1, 2). The Ghent Nosology in 1996 is the gold standard for diagnosis of Marfan's syndrome and documents the clinical signs affecting seven body systems: skeletal, ocular, cardiovascular, pulmonary, skin/integument, dura and genetic findings. Two major and one minor criteria, or one major and two minor criteria are required for diagnosis. The three main systems more commonly affected are cardiovascular, ocular and musculoskeletal (1–4).

The clinical manifestation of Marfan's syndrome is variable. There are three main cardiovascular presentations noted in the literature of Marfan's syndrome. Neonatal Marfan's syndrome is a more severe form with clinical progression and severe cardiovascular manifestations. These involve mitral and tricuspid regurgitation with dilatation of both aortic root and main pulmonary artery. The childhood clinical cardiovascular presentation involves the mitral valve, with prolapse and regurgitation. The adolescent and adult

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presentation involve predominantly the aorta and its valve (1–5). Pregnant patients with Marfan's syndrome, especially those presenting with a dilated aortic root diameter for age and body surface area, have an increased risk of aortic aneurysm, dissection and rupture (6).

There is a different clinical outcome for patients diagnosed in childhood in comparison to those diagnosed after 18 years of age having an increased cardiac morbidity. Patients diagnosed in adulthood who did not have the benefit of prophylactic medication and follow-up were more likely to need aortic root replacement urgently secondary to aortic regurgitation and dissection (1, 3–5).

There is no known documented case of aortic left coronary sinus with dissection and rupture in a pre-pubertal child, with a left coronary artery fistula, with proximal and distal aneurysm, and fistulous communication with right superior vena cava leading to continuous flow noted on Doppler in the right atrium. Continuous flow on pulsed wave and colour Doppler confirms fistulous communication with right upper pulmonary veins.

CASE REPORT

A 16-year old first trimester pregnant female was noted at 12 years of age to have a "patent ductus arteriosus type" continuous 'machinery' murmur, preceded by sticking chest pain. She was not on any medications nor was any restrictions made on physical activity.

She was currently symptomatic with intermittent sticking chest pain at the left sternal edge, relieved by rest, and shortness of breath mainly on exertion but occasionally at rest. She was functioning at New York Heart Association (NYHA) II. Evaluation of her cardiovascular status by the cardiologist confirmed specific signs noted in the Ghent criteria. She had tall stature; her arm span was greater than her height (> 1.05 m), arachnodactyly, high arched palate and a continuous murmur maximal in upper right sternal edge.

Electrocardiogram showed sinus rhythm with a heart rate of 76 beats per minute. Transthoracic echocardiogram showed dilated aortic root, tri-leaflet aortic valve with aneurysmal dilatation of all three coronary sinuses of Valsalva. Ruptured left coronary sinus of Valsalva with fistulous communication with both right atrium and left atrium was identified. Bowing of the inter-atrial septum to the left indicated high right atrial pressures. Mild increase in pulmonary valve flow was suggestive of mild pulmonary valve stenosis or indicative of increased flow across the pulmonary valve secondary to left to right shunt causing pulmonary valve increased flow. There was an intimal flap in the ascending aorta adjacent to the non-coronary sinus of Valsalva. Trace tricuspid regurgitation and trace pulmonary regurgitation indicated normal right ventricular pressures and pulmonary artery pressures.

Multidetector computed tomography (CT) coronary angiogram revealed: a left coronary sinus of Valsalva aneurysm extending to involve the left main coronary artery.

The left coronary aneurysm leads to a dilated retro-aortic fistula tapering to 0.7 cm, then becoming aneurysmal between the inferior part of the superior vena cava and the right superior pulmonary vein. The aneurysmal part of the distal fistula and the superior vena cava was visible (Figs 1–5).

She satisfied the Ghent Criteria for diagnosis of Marfan's syndrome.

The increased morbidity and mortality of pregnant patients with Marfan's syndrome, taking into account the specific anatomic diagnosis this patient had, led to a decision to terminate the pregnancy, where the risk of morbidity and mortality in this case would exceed 90%. Aortic root replacement was recommended.

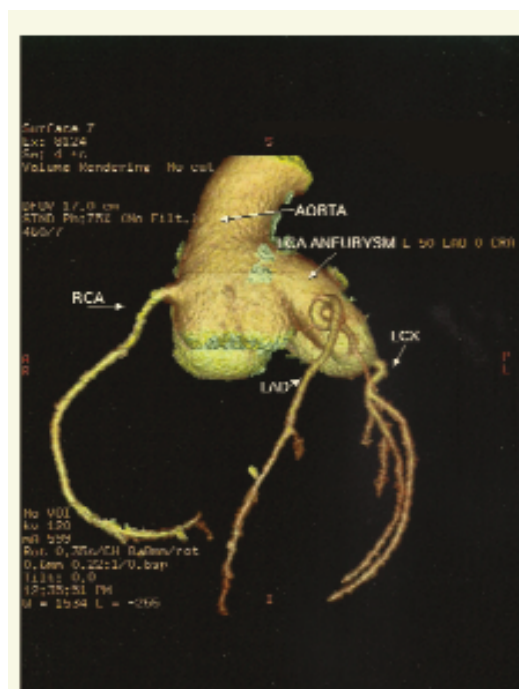


Fig. 1: Left coronary artery aneurysm.

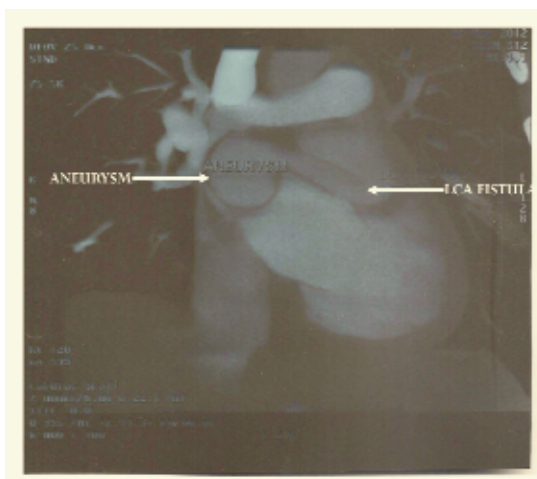


Fig. 2: Left coronary artery (LCA) aneurysm on mid-LCA.

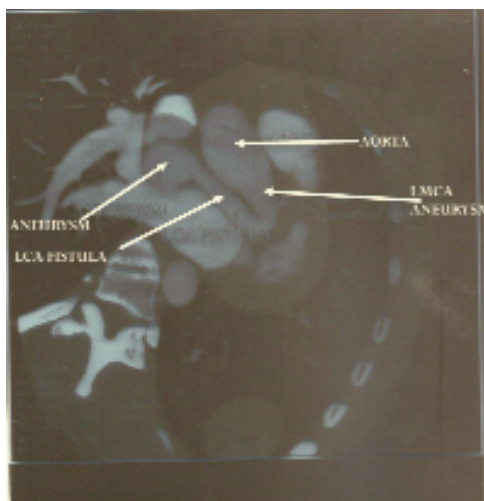


Fig. 3: Left coronary artery fistula and aneurysms.

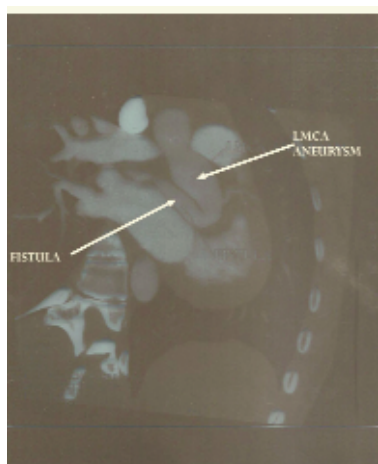


Fig. 4: Left main coronary artery (LMCA) aneurysm and fistula.

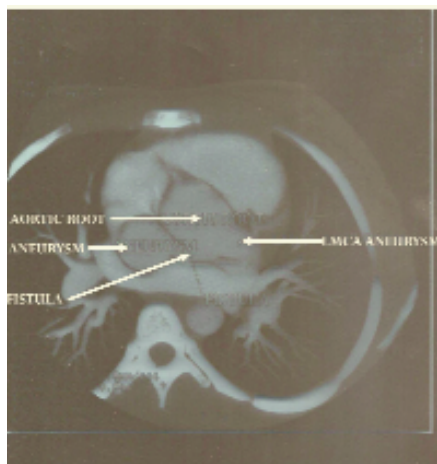


Fig. 5: Aortic root, fistula and proximal and left main coronary artery (LMCA) aneurysms.

DISCUSSION

The inherent deficiency of elastin in Marfan's syndrome leads to reduced strength of the blood vessel wall. Aortic valve and pulmonary valve aneurysmal dilatation of the sinuses of Valsalva are documented but aorta involvement predominates and is the major cause of morbidity and mortality in adults (3–5). Pediatric Marfan's syndrome with left coronary sinus aortic aneurysms is rare and dissection of the coronary sinus of Valsalva with left coronary artery aneurysms and fistulas, to our knowledge after extensive search in the English literature, has never been documented. The increased incidence of aneurysms occurring in the ascending aorta is believed to be, and in the case report, due in part to there being a greater amount of elastin fibres and the much greater pressures in the ascending aorta. These factors have been suggested to be the cause of the higher incidence of intra-abdominal arterial aneurysms affecting renal, hepatic, distal aorta and superior and inferior mesenteric arteries (3, 4).

The varied cardiovascular manifestations range from sudden death noted especially in athletes with Marfan's syndrome secondary to aortic dissection and rupture to totally asymptomatic where the aortic root dilatation and mild valvular pathology finding are incidental on routine evaluation of a suspected case of Marfan's syndrome. The incidence of Marfan's syndrome varies from 1 in 5000, 1 in 9800 to 1 in 20 000, depending on the series of patients studied. This precludes routine screening of this condition which would not be cost effective. Hence a high index of suspicion is required for diagnosis. The mean life expectancy of Marfan's syndrome is 32 years, with cardiac disease involving the aortic valve, aorta and mitral valve causing death in over 90% who succumb. Close follow-up with the use of modern technology and prophylactic medical treatment with beta-blockade and ATI receptor antagonist, or other types of antihypertensive medication with a view to keeping the systolic pressure less than 110 mmHg and cardiothoracic surgical intervention significantly reduces morbidity and mortality in Marfan's syndrome. Other prophylactic medication suggested for patients are calcium channel antagonists and angiotensin converting enzyme (ACE) inhibitors. Enalapril reduced the rate of aortic dilatation compared to beta-blockers in a small study with children and adolescents (1–5).

Early detection and diagnosis is necessary to achieve an improved standard of living and longevity of patients with Marfan's syndrome. Adults presenting with Marfan's syndrome without the benefit of close follow-up, restriction on physical activity and prophylactic medication have a higher incidence of cardiac surgical interventions which are urgent. Patients with Marfan's syndrome requiring urgent surgery for dissection have a higher incidence of further surgical intervention and progressive aorta and aortic valve disease. Aortic root replacement is advised using the Bentall operation with the cryopreserved valved aortic homografts or pros-

thetic conduits; this requires the use of anticoagulants to facilitate childbearing in women without the use of warfarin which has teratogenic effects and potential bleeding complications (7, 8).

The Ross procedure is another alternative for replacement of the diseased aortic valve with the pulmonary valve receiving the homograft (9).

Transcatheter closure of the fistula is not an option recommended in Marfan's syndrome, as the underlying pathology with fibrillin-1 still exists (10–12).

Diagnosis in childhood of Marfan's syndrome leads to elective root replacement and cardiac surgical intervention which leads to a low morbidity and mortality. A multi-disciplinary approach to management, taking into account all the systems involved is necessary. Ocular manifestation in one series was seen in up to 56% of patients with Marfan's syndrome affected in childhood. Genetic counselling to families diagnosed with Marfan's syndrome would lead to early detection and management of affected family members, where clinical findings can be variable. Variability of findings is also attributed to ethnicity. The Mexican population with Marfan's syndrome is a specific ethnic group of patients where an author indicated a more severe form of clinical manifestations with a higher incidence of inter-atrial septal aneurysm (2–4, 13).

The life of a patient with Marfan's syndrome can be markedly improved with early detection, close follow-up, prophylactic medical and surgical intervention with genetic counselling.

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