Association Of İnterrupted Aortic Arch Type C And Microdeletion 22q11.2: A Newborn Case Report

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Abstract

Background:

DiGeorge syndrome is a congenital genetic disorder characterized by a variety of findings, including cardiac defects, craniofacial dysmorphism, cleft palate, thymic hypoplasia and hypoparathyroidism. This rare syndrome is mainly caused due to deletion of chromosome 22q11.2. The patients with this condition are prone to develop *infections* due to poor T-cell formation and function. DiGeorge syndrome is frequently associated with interrupted aortic arch (IAA) and truncus arteriosus. Here we report a case of IAA type C associated with 22q11.2 deletion.

Case:

A 7-day-old female newborn was admitted with signs of cardiac failure and mild cyanosis. Physical examination revealed a grade 3/6 precordial systolic murmur, moderate hepatomegaly, normal peripheral pulses and facial dysmorphism. Echocardiography showed a large perimembranous ventricular septal defect (VSD), IAA (aortic interruption between the innominate artery and the left carotid artery; type C) with a wide ductus arteriosus. At day 9, she was operated for the correction of IAA and *patch* closure of the *VSD* via a median full sternotomy. Hypocalcemic convulsions caused by hypoparathyroidism occurred at day 10, requiring intravenous calcium supplementation and anticonvulsant therapy. Cytogenetic evaluation revealed chromosomal abnormality; 46,XX,del (22)(q11.2). She was diagnosed to be DiGeorge syndrome with characteristic physical features and genotypic findings. The patient was discharged at day 28 in good health. Presently, at 6th month, the child has slightly retarded growth and mild tachydyspnea. She has complained recurrent respiratory infections. She is still under follow-up of departments of pediatric cardiology, genetics, pediatric immunology, and developmental pediatrics.

Conclusion:

By this report we would like to point out that all patients with IAA who have additional features specific for 22q11.2 microdeletion syndrome should be screened for the presence of this deletion.

Keywords: *DiGeorge syndrome, interrupted aortic arch, newborn*

Introduction

Interrupted aortic arch (IAA) is a severe congenital heart defect which is divided into three types (A, B, and C) according to the absence of the luminal continuity between the ascending

and descending aorta (1). DiGeorge syndrome is frequently associated with interrupted aortic arch (IAA) and truncus arteriosus (2). DiGeorge syndrome is a congenital genetic disorder characterized by a variety of findings, including cardiac defects, craniofacial dysmorphism, cleft palate, thymic hypoplasia and hypoparathyroidism. This rare syndrome is mainly caused due to deletion of chromosome 22q11.2. Frequently, IAA type B is accompanied to DiGeorge syndrome. IAA type C is also considered to have similar genetic mechanisms with IAA type B (3-6). However, there are rare reports on the 22q11.2 microdeletion and association of IAA type C (3-5). Here we report a case of IAA type C associated with 22q11.2 deletion.

Case report

A 7-day-old female newborn who was born by cesarean delivery at 38 wees of gestation. The The pregnancy was uncomplicated and the parents were healthy. The parents were first cousins. She had one healthy sibling. She was admitted to emergency department with signs of cardiac failure and mild cyanosis and hospitalized in NICU. Physical examination revealed a grade 3/6 precordial systolic murmur, moderate hepatomegaly, normal peripheral pulses and facial dysmorphism. The chest X-ray film showed an enlarged cardiac shadow (Fig.1). Echocardiography and angiography showed a large perimembranous ventricular septal defect (VSD), IAA (aortic interruption between the innominate artery and the left carotid artery; type C) with a wide ductus arteriosus (Fig. 2). We started prostaglandin E l infusion. At day 9, she was operated for the correction of IAA and *patch* closure of the *VSD* via a median full sternotomy. Hypocalcemic convulsions caused by hypoparathyroidism occurred at day 10, requiring intravenous calcium supplementation and anticonvulsant therapy. No other malformations were detected. Cytogenetic evaluation revealed chromosomal abnormality; 46,XX,del (22)(q11.2). She was diagnosed to be DiGeorge syndrome with characteristic physical features and genotypic findings. The patient was discharged at day 28 in good health. Presently, at 6th month, the child has slightly retarded growth and mild tachydyspnea. She has complained recurrent respiratory infections. She is still under follow-up of departments of pediatric cardiology, genetics, pediatric immunology, and developmental pediatrics.

Discussion

A rare type of congenital heart disease is an IAA, which affects approximately 1.5% of congenital heart disease patients (7). IAA is an anomaly that can be considered the most severe form of aortic coarctation (8). In an IAA, there is an anatomical and luminal disruption between the ascending and descending aorta. IAA is a ductus dependent lesion since this is the only way the blood flow can travel to places distal to the disruption. There is posterior malalignment of the conal septum additional to the interrupted aortic arch, producing a VSD as an associated lesion. This lesion is present in approximately 73% of all cases. Besides a VSD, IAA can be associated with other more complicated cardiac anomalies; for example, transposition of the great arteries, truncus arteriosus, aortopulmonary window, single ventricle, aortic valve atresia, right-sided ductus, and double-outlet right ventricle (7). The incidence of IAA is about 2 cases per 100,000 live births (9). Nearly all patients with IAA present in the first 2 weeks of life when the ductus arteriosus closes. Most patients present in the first day of life. The presented case here also had a large perimembranous VSD associated to IAA with a wide ductus arteriosus. She was admitted to NICU on the 7th day of life.

Once diagnosed, the treatment is immediate surgery. The objective of the surgery is to form unobstructed continuity between the ascending and descending aorta and to repair associated defects with the most common atrial and/or ventricular septum defect. The repair is done using either native arterial tissue, a homograph, or autograph vascular patch. For VSD, repairs are

closed with a synthetic patch. Our patient was operated at day 9 for the correction of IAA and *patch* closure of the *VSD* via a median full sternotomy.

DiGeorge syndrome is a congenital genetic disorder characterized by a variety of findings, including cardiac defects, craniofacial dysmorphism, cleft palate, thymic hypoplasia and hypoparathyroidism. This rare syndrome is mainly caused due to deletion of chromosome 22q11.2. On the fourth to the sixth week of gestation, the cardiac neural crest cells migrate from the hindbrain region to the pharyngeal arches (7). Recent evidence revealed that these migrated cells were coordinated for proper remodeling of the aortic arch by the several signals coded at human chromosome 22q11.2.

DiGeorge syndrome is frequently associated with interrupted aortic arch (IAA) and truncus arteriosus (10). Here we report a case of IAA type C associated with 22q11.2 deletion. Fujii et al. (5) described on the first case of IAA type C detected in Japan who is associated with DiGeorge syndrome in 22q11.2 hemizygosity. Our case is also a clinical case that advocated one of the genetic causes was 22q11.2 deletion for development of IAA type C.

The patients with this condition are prone to develop *infections* due to poor T-cell formation and function (3). Our patient, presently, (6-month-old), has slightly retarded growth and mild tachydyspnea. She has complained recurrent respiratory infections. She is still under follow-up of departments of pediatric cardiology, genetics, pediatric immunology, and developmental pediatrics.

By this report we would like to point out that all patients with IAA who have additional features specific for 22q11.2 microdeletion syndrome should be screened for the presence of this deletion.

Figure legends:

Figure 1: Chest X-ray of the patient with interrupted aortic arch, showing enlarged cardiac shadow and pulmonary edema.

Figure 2: Angiographic image of the same patient sshowing aortic interruption between the innominate artery and the left carotid artery; type C with a wide ductus arteriosus.

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