D-Transposition of Great Arteries in a Primigravida of 35 Years Old—Case Report and Literature Review

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Abstract: This is a case report with discussion of the maternal-fetal outcome of pregnant women with uncorrected transposition of the great arteries (TGA) associated with pulmonary arterial hypertension and a large ventricular septal defect. This case draws attention to the severity of the pathology and maternal symptoms prior to gestation, and how an adequate clinical management of both obstetrics and cardiology can provide a favorable outcome for mother and fetus.

Key words: Transposition of great arteries, congenital heart disease, bosentan, pregnancy.

1. Introduction

Cardiac disease complicates approximately 4% of all pregnancies in the United States being congenital heart diseases three times more common than acquired [1]. The advances and improvement in the management of the congenital heart disease resulted in an increased number of women with heart disease reaching childbearing age and estimates that 80% to 85% of neonates born with congenital heart defects will reach adulthood [2].

Most adults with d-transposition of the great arteries (d-TGA) have undergone either an ~~atrial~~ baf procedure or an arterial switch repair in childhood. Pregnancy associated to d-TGA is a condition of high maternal and fetal mortality, especially when associated with significant pulmonary hypertension.

Pregnancy determines changes in the hematologic and cardiovascular systems during gestation and the peripartum period. Patients with congenital heart disease have increased risks of complications as

arrhythmias, stroke, pulmonary edema, heart failure, intensive care unit admission, and death [3]. Pregnancies complicated by congenital heart disease would have an increased incidence of maternal and fetal complications. Khairy et al. [4] found 25% of cardiac events in 90 pregnancies of 53 patients with congenital heart disease and were limited to heart failure with pulmonary edema, symptomatic arrhythmias, and need for urgent invasive intervention and found 27.8% of adverse neonatal outcomes.

We describe a first-time pregnancy of an uncorrected d-TGA with serious clinical condition, oxygen support, and previous stroke treated with multidisciplinary support and successful outcome of the case.

2. Case Report

A 35 years old, primigravida, has previous history of uncorrected d-TGA, ventricular septal defect and pulmonary artery hypertension. She was referred to the cardiology office with 19 weeks of gestation and taking bosentan 125 mg twice a day, sildenafil 25 mg three times a day, nifedipine, oxygen by nasal catheter every night and complaining of worsening weakness and

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fatigability since two weeks. She was previously hospitalized to tubal ligation but she refused the procedure.

On the admission, she had dyspnea on small activity, oxygen saturation of 82%, cyanotic with left hemiplegia and all the drugs were stopped, except for prophylactic enoxaparin once a day use, hydration, continuous oxygen treatment and all day bed rest.

Electrocardiogram showed normal sinus rhythm, right axis deviation, and signs of right ventricle hypertrophy in Fig. 1.

She had secondary polycythemia with hemoglobin 18 g/dL.

The transthoracic echocardiogram (Fig. 2) showed situs solitus, d-TGA, huge ventricular septal defect with bidirectional shunt and signs of pulmonary artery hypertension. On admission the obstetric ultrasonography, fetal anomaly scan and fetal 2D-echocardiogram were normal.

The patient progressed satisfactorily and stably until 29 weeks of pregnancy then was submitted to caesarean

with general anesthesia section, due to resting dyspnea, restriction to intrauterine growth and impaired placental uterine flow. The patient received antibiotic prophylaxis and evolved stable during the surgery without needs of vasoactive drugs and being submitted to tubal ligation. The patient stayed for two weeks in the intensive care for cardiovascular and clinical improvement with cardiac monitoring, intravenous furosemide, oxygen with nasal catheter, subcutaneous enoxaparin, and the newborn stayed for two months in the intensive unit due to premature care but without congenital and cardiac changes. Mother was discharged and keeps in NYHA III, performing follow-up in the cardiology office taking bosentan 125 mg twice a day, sildenafil 25 mg three times a day, furosemide 40 mg, continuous oxygen therapy, captopril 12.5 mg three times a day, carvedilol 3,125 mg twice a day, and warfarin. Mother and newborn is evolving uneventfully until nowadays. The patient was counseled for heart and lung transplant.

3. Discussion

Congenital heart disease and pregnancy is associated with risks to mother and fetus. In a registry of the European Society of Cardiology, congenital heart disease was the most prevalent form of structural heart disease (66 percent) affecting pregnancy outcomes worldwide [5]

Transposition of the great arteries is one of the most common cyanotic defects seen in newborns, with a prevalence of 4.7 per 10,000 live births [6] and when the ventricular septum is intact, it is usually cyanotic in the first day of life. TGA accounts for approximately 3 percent of all congenital heart disease disorders and almost 20 % of all cyanotic congenital heart diseases [7] and is characterized by an aorta arising from the morphological right ventricle (RV), and the pulmonary artery arising from the morphological left ventricle. The d-TGA (i.e., right side position of the right ventricle) has parallel great arteries circulation rather than crossing as we find in normal hearts in addition to

Fig. 1 Electrocardiogram of d-TGA and right ventricular hypertrophy signs.

Fig. 2 Transthoracic echocardiogram—apical view. VD—right ventricle; VE—left ventricle; AO—aorta; AP—pulmonary artery; CIV—ventricular septal defect.

the aorta being located anteriorly and to the right. On the uncorrected d-TGA the circulation is based on a deoxygenated systemic venous blood draining into the right atrium and then is pumped from the right ventricle back to the systemic circulation via the aorta. Oxygenated pulmonary venous blood returns to the left atrium and ventricle, and is then recirculated to the lungs via the pulmonary artery. This parallel circuit is incompatible with life, so we can find another congenital associated defects as ventricular septal defect, pulmonary outflow tract obstruction, and, less commonly, coarctation of the aorta. Besides all these congenital changes, there are coronary artery variations and mitral and tricuspid valve abnormalities as overriding valves and straddling of the tricuspid valve.

Ventricular septal defect occurs in approximately 50 percent of patients with d-TGA. The associated ventricular septal defect can be found in any region of the ventricular septum [8].

The electrocardiogram showed a right ventricle hypertrophy, compatible with the advanced phase, and clinical manifestation of the congenital disease.

Pregnancy dictates physiologic changes, increasing risks of maternal and neonatal complications in women with congenital heart disease. Maternal complication ranges from heart failure, arrhythmias, endocarditis, thromboembolic events, deterioration of NYHA

functional class, preeclampsia and eclampsia. In women with congenital heart disease the risk of miscarriage is substantially increased. Fetal risks comprise mainly the risk of prematurity, low birth weight, small for gestational age and offspring mortality. The recurrence risk of isolated CHDs in the offspring is on average 3%-5% [9].

Siu et al. [10] in a study of almost 600 pregnancies complicated by maternal cardiac disease, found 20% of neonatal complications associated with poor functional class or cyanosis, left heart obstruction, anticoagulation, smoking, and multiple gestations. Maternal complications were predicted by functional class, prior cardiovascular events (heart failure, transient ischemic attack, stroke before pregnancy or arrhythmia), left ventricular function < 40%, and left heart obstruction [10].

Silversides et al. [11] enrolled 1,938 women with heart disease and pregnancy, being 63.7% with congenital heart disease, and found 16% of complications related to arrhythmias and heart failure. The study revealed ten predictors of maternal complications, that were included in the a new CARPREG II index divided into 5 categories based on the sum of the points for a given pregnancy as seen in Table 1 [11]. According to de CARPREG II risk score the patient is at high risk of maternal cardiovascular

Table 1 Risk prediction according to the CARPREG II risk score.

CARPREG II risk score: predictors of maternal cardiovascular events	
1. Prior cardiac events or arrhythmias (heart failure, transient ischemic attack, stroke before pregnancy or arrhythmia)—3 points	
2. NYHA functional class > II or Cyanosis (room air saturation < 90%)—3 points	
3. Mechanical valve—3 points	
4. Ventricular dysfunction—2 points	
5. High risk left-sided valve disease/left ventricular outflow tract obstruction	
6. Pulmonary Hypertension—2 points	
7. Coronary artery disease—2 points	
8. High risk aortopathy—2 points	
9. No prior cardiac intervention—1 point	
10. Late pregnancy assessment—1 point	
Risk estimation of maternal cardiovascular complications	
No. of predictors	Risk of cardiac event in pregnancy (%)
0 to 1 points	(5%),
2 points	(10%),
3 points	(15%),
4 points	(22%),
> 4 points	(41%)
NYHA—New York Hear Association	

complications due to previous stroke, pulmonary hypertension with cyanotic congenital heart disease and advanced functional class.

Presbitero et al. [12] described a series of 416 women with congenital heart disease and 822 pregnancies. The outcomes of 96 pregnancies in 44 patients with cyanotic congenital heart disease were divided arbitrarily into groups according to the type of maternal congenital cardiac anomaly, and showed that maternal cardiovascular complication was high (32%), with one death from endocarditis 2 months after delivery. Forty-one (43%) of 96 pregnancies resulted in a live birth; 15 (37%) were premature. Hemoglobin, and arterial oxygen saturation before the pregnancy were factors that discriminated between successful and unsuccessful fetal outcome, with hemoglobin > 17 g/dL and arterial oxygen saturation < 85% being the most important predictors [12].

Beside all the clinical severity the patient kept taking bosentan until the hospitalization when the drug was withdrawn from her daily hospital prescription.

Bosentan is an antagonist endonothelin-1 receptor recommended for pulmonary artery hypertension and is associated with teratogenic effects in animal studies. In rodents given approximately two times the recommended maximum human dose on mg/m² basis, there was a higher rate of fetal death, malformations of the head and face, and abnormal vascular development. Based on these results, the FDA classified bosentan a category X drug (contraindicated during pregnancy). Although the patient made use of bosentan, the newborn did not present any congenital anomaly.

Galiè et al. [13] assigned 54 patients with World Health Organization functional class III Eisenmenger syndrome for 16 weeks for oral bosentan and showed that systemic arterial blood oxygenation did not worsen on therapy, the mean and pulmonary resistance fell significantly, and improved significantly the exercise capacity.

Sildenafil is a phosphodiesterase-5 (PDE-5) inhibitor. It acts by preventing the degradation of the

second messenger cyclic guanosine 3',5'-monophosphate by the enzyme PDE-5. This results in increased nitric oxide production and consequent vascular smooth muscle relaxation and an increase in vasodilation.

Dunn et al. [14] in a systematic review of effect of sildenafil in maternal and fetal complications did not find any risk of malformations for patients taking sildenafil during pregnancy.

There are few data in the literature about patients with uncorrected d-TGA and pregnancy. Almost all the cases reported are about prior reparative cardiac surgery and pregnancy, although some with a large VSD and pulmonary vascular disease sometimes may survive with Eisenmenger physiology as seen in our case.

In women with certain types of severely decompensated CHD (i.e., Eisenmenger syndrome), the benefits of avoiding labor outweigh risks of cesarean delivery (i.e., large fluid shifts due to increased blood loss and wound infection), and planned cesarean are preferred as was done in this case [15].

Anticoagulation should be considered in this case due to previous stroke, polycythemia and thrombotic status.

Heart and lung transplantation should be advised in this patient situation. In a report of 37 patients with Eisenmenger syndrome and severe pulmonary arterial hypertension (PAH), the one- and three-year survival rates were 97 and 77 percent, respectively [16].

4. Conclusions

Complex congenital heart disease and pregnancy are a challenge and delicate medical situation that is regarded as a multidisciplinary team for better assessment and successful treatment. Risks can be reduced by careful, integrated care by the informed cardiologist and obstetrician throughout the pregnancy, delivery, and postpartum period.

The reported case revealed a patient with advanced

cyanotic heart disease, deteriorated functional class, with previous stroke, high hemoglobin level, low oxygen saturation and use of bosentan with high risk of teratogenicity, high risk of clinical complications but fortunately had good maternal and fetal clinical outcomes.

Even in the absence of a congenital anomaly we must be careful in the use of drugs with high risk of congenital malformations.

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