

Pregnancy in Women with Aortic Stenosis

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Abstract

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OBJECTIVE: The aim of this study was to provide data about the course and outcome of pregnancy in the women with aortic stenosis (AS) with special attention to complications in pregnant with severe AS, which was asymptomatic prior to conception.

METHODS: Eleven pregnant women with different grades of AS were monitored in ambulatory and clinical conditions during pregnancy, childbirth and the post-partum period. The Apgar scores of the neonates born by mothers with AS were compared to those of neonates born by healthy mothers, using the variation statistical analysis.

RESULTS: In the group with severe AS, asymptomatic prior to conception, aggravation of the NYHA functional class (FC) with left ventricular heart failure was observed. Pregnancy, childbirth and post-partum period were normal in the group with moderate aortic stenosis and in those with ventricular defects, corrected prior to conception. The sums of the Apgar scores for the whole group did not differ from those for the neonates, born by healthy mothers.

CONCLUSION: The results suggest that there is a need of consensus for the complex of examinations, enabling diagnostic differentiation of pregnant women with severe AS requiring urgent defect correction and, the prognosis of pregnancy in women with asymptomatic severe AS.

Introduction

Aortic stenosis (AS) is the third, in terms of incidence, cardiac disease in Europe and the USA after the ischaemic heart disease and arterial hypertension. 28% of the AS cases are with congenital aortic stenosis (CAS). Rather different prognostic data have been provided by some series of studies, involving usually a small number of pregnant women with AS, in which frequently, the severity of stenosis has not been evaluated. The primary hemodynamic abnormality in aortic stenosis is obstruction to the left ventricular outflow which leads to a pressure gradient between the left ventricle and aorta during the systolic ejection period. An aortic orifice of less than 0.7cm² per m² body surface area i.e. less than 1/3rd of the normal orifice is considered as critical obstruction to the left ventricular outflow. Exertional dyspnea, angina pectoris and syncope are the three cardinal symptoms [1]. Medical practice has

shown that in women with mild to moderate AS and in those with cardiac defects, corrected prior to conception, pregnancy usually follows its normal course. In symptomatic AS, pregnancy is contraindicated because of the existing high risk for both the mother and the foetus [2].

During pregnancy, haemodynamic changes occur, presented by increased blood volume, cardiac output and heart rate, and reduced peripheral vascular resistance [3, 4], which may enhance the evolution of asymptomatic to symptomatic AS. Symptomatic AS includes clinical signs of left ventricular insufficiency with pulmonary congestion and nocturnal dyspnoea, orthopnoea, stenocardia, syncope, life-threatening ventricular arrhythmias and sudden cardiac death [5, 6].

In severe symptomatic AS, foetal prognosis is also aggravated by probable foetal growth retardation, premature birth, low body weight or development of a

congenital cardiac defect [6, 7].

The presence of severe AS and marked cardiac symptoms require, prior to conception, correction of the aortic valvular defect by applying a suitable method, as the percutaneous aortic valvuloplasty is the technique of choice.

In current cardiologic practice, the AS severity is determined by the following parameters: aortic valve orifice area, mean systolic left ventricular-aortic pressure gradient and maximal systolic blood flow velocity. These indices are obtained during echocardiographic and invasive examinations of individuals, who will undergo cardiac surgery [2, 7].

In pregnant women with AS, measurements of the mean systolic pressure gradient and the maximal systolic blood flow velocity are not sufficiently exact because the parameters, which are of importance for their magnitudes (cardiac output, heart rate and systolic ejection velocity) are affected by pregnancy-related haemodynamic changes. Taking into consideration the above-stated, it is recommended to assess the aortic defect severity in pregnant women with AS only on the basis of the parameter Aortic Valve Orifice Area [2, 7]. Grades of AS severity in pregnant women, based on the measurements of Aortic Valve Orifice Area [2, 7] are presented in Table 1.

The aim of this study was to provide data about the course and outcome of pregnancy in the women with aortic stenosis (AS) with special attention to complications in pregnant with severe AS, which was asymptomatic prior to conception.

Materials and Methods

The Specialised University Hospital for Active Treatment in Obstetrics and Gynaecology "Maichin Dom" is a referral centre for pregnant women with comorbidities such as AS. As per protocol patients are admitted to hospital 20 days before their estimated delivery date in order to decide on the mode of delivery. Women in our research have had their pregnancies followed up and have attended for delivery in Specialised University Hospital for Active Treatment in Obstetrics and Gynaecology "Maichin Dom" from January 2008 to January 2013.

Table 1: Grades of AS, based on measurements of Aortic Valve Orifice Area.

Grades of AS	Aortic Valve Orifice Area (cm ²)	Aortic Valve Orifice Area Index (cm ² /m ²)
Mild AS	> 1.5	> 0.9
Moderate AS	> 1.0 – 1.5	0.6 – 0.9
Severe AS	≤ 1.0	≤ 0.6
Very severe AS	≤ 0.7	≤ 0.4

Eleven pregnant women with congenital AS were monitored by the authors in ambulatory and clinical conditions during pregnancy, childbirth and the early post-partum period (duration of 7.25 ± 4.40 days) from January 2008 to January 2013. Six women

were with subvalvular AS and five of the monitored women were with valvular AS. The mean age was 21.2 ± 6.0 years. Nine women were pregnant for the first time and two women – for the second time with one volitional abortion each. Five of the monitored women had undergone surgical correction of the aortic defect 11.8 ± 4.1 years prior to conception. The grade of AS severity was determined echocardiographically by measuring the Aortic Valve Orifice Area. In the pregnant women with cardiac arrhythmias, electrocardiographic monitoring and Holter ECG were performed. The functional class of the cardiac disease was determined in accordance with the classification of the New York Heart Association (NYHA). Mode of delivery was determined taking into consideration the functional class of the cardiac disease, obstetric and foetal indications. All the deliveries took place in the delivery ward monitored by cardiotocography (CTG) and maternal monitoring by single-lead ECG, heart rate, blood pressure and oxygen saturation under the supervision of multidisciplinary team of obstetrician, cardiologist and neonatologist. In a previously prepared form, the results of the routine obstetric, laboratory and cardiologic examinations were registered, as well as the complications, occurred during the pregnancy, childbirth and postpartum period.

The sums of the Apgar scores, as per local protocol, at the first, third and fifth minute post partum of the neonates, born by the mothers with AS were compared with these of the neonates, born by healthy mothers, as the statistical method of variation analysis was used.

Results

The data of the monitored pregnant women with AS are presented in Table 2. Favourable pregnancy outcomes were observed in the majority of the women with AS, corrected prior to conception and in those with moderate AS. One woman with a partial correction of the cardiac defect (case No 11) had pregnancy-related anaemia and another woman with mild AS (case No 5) experienced episodes of supraventricular paroxysmal tachycardia.

These complications were successfully managed by appropriate treatment. During pregnancy, the majority of the women with surgical correction of the AS and these with mild AS retained their functional classes, presented prior to conception.

The three women with severe asymptomatic AS prior to conception aggravated their functional classes after the second trimester with manifestations of left-sided heart failure and pronounced pulmonary congestion. Complex ventricular extrasystoles and episodes of ventricular and supraventricular paroxysmal tachycardia were observed in case No 2, with a temporary response to the treatment. In this woman, colpitis was also found. Complex ventricular

extrasystoles and myocardial ischaemia, confirmed by ECG, were observed in case No 3.

Table 2: Data of the pregnant women with AS and of the complications, occurred during pregnancy.

Patient	Age (yrs)	Grade of AS	AVOA (cm ²)	FC1	Complications during pregnancy	FC2
1	20	Asymptomatic, very severe	0.7	III	Left ventricular insufficiency	IV
2	21	Asymptomatic, severe	0.9	II	Left ventricular insufficiency, complex ventricular extrasystoles, ventricular and supraventricular paroxysmal tachycardia	III
3	31	Asymptomatic, severe	0.8	II	Frequent and volley ventricular extrasystoles, myocardial ischaemia	III
4	19	Moderate	1.1	II		II
5	20	Moderate	1.2	I		I
6	17	Moderate	1.2	I	Supraventricular paroxysmal tachycardia	I
7	23	Corrected	3.0	I		I
8	20	Corrected	3.2	I		I
9	26	Corrected	3.0	I		I
10	25	Corrected	3.4	I		I
11	19	Corrected	1.9	I	Pregnancy-related anaemia	I

AS – aortic stenosis; AVOA – aortic valve orifice area; FC1 – NYHA functional class prior to pregnancy; FC2 – NYHA functional class during pregnancy.

In Table 3, data of the mode of delivery and the post partum period are presented for the monitored women with AS. Two of the women with severe AS delivered via caesarean section and the third one required the use of an outlet forceps during the foetal expulsion for obstetrical reasons (nonreassuring foetal heart rate pattern). A perineal trauma occurred in case No 4 and preterm deliveries resulted in case No 2 and No 11. In the post-partum period, the women with severe AS maintained their aggravated functional classes and cases no 2 and 3 had ventricular arrhythmias, irresponsive to conventional therapy (beta-blockers, amiodarone). Aggravated functional classes in the post-partum period were also registered in one woman with moderate AS (case No 4) and in one woman with a partial correction of the stenosis (case No 11).

Table 3: Type of delivery and postpartum period.

Patient	Grade of AS	Gest. weeks	Type of delivery	Postpartum period	FC3
1	Severe AS	38	CS	Cardiac insufficiency	IV
2	Severe AS	33	Forceps	Cardiac insufficiency, ventricular extrasystoles	III
3	Severe AS	39	CS	Cardiac insufficiency, ventricular extrasystoles	III
4	Moderate AS	38	RVD		I
5	Moderate AS	39	RVD		I
6	Moderate AS	39	RVD		I
7	Corrected AS	38	RVD		I
8	Corrected AS	39	RVD		I
9	Corrected AS	38	RVD		I
10	Corrected AS	39	RVD		I
11	Partially corrected AS	34	RVD		II

AS – aortic stenosis; CS – Caesarean section; RVD – regular vaginal delivery; FC3 – NYHA functional class in the post-partum period.

In Fig. 1, the data of the observed pathological changes in 5 of the neonates, born by the mothers with AS, are presented. Two of the three

women with severe AS gave birth to infants with serious health problems: congenital cardiac and body anomalies (case No 1), preterm delivery and neonatal asphyxia (case No 2). One of the mothers with moderate AS and frequent episodes of supraventricular paroxysmal tachycardia during her pregnancy gave birth to an infant with a respiratory distress syndrome, while the second preterm infant was born by the mother with a partial correction of the aortic defect and anaemia during her pregnancy.

Newborn by mother No 1: cardiomegaly and a defect of the auricle
 Newborn by mother No 2: preterm born with asphyxia
 Newborn by mother No 6: respiratory distress syndrome
 Newborn by mother No 7: umbilical cord tied round the neck
 Newborn by mother No 11: preterm born

Figure 1: Data of the neonates with defects, born by the mothers with AS.

In Table 4, the sums of the Apgar scores of the neonates, born by the mothers with AS are compared with those of the neonates, born by healthy mothers. Although the above-stated pathological changes in the neonates, born by the mothers with AS, the sums of the Apgar scores at the first, second and third minute for the whole group do not differ from those for the neonates, born by healthy mothers.

Table 4: Sums of the Apgar scores at the first, third and fifth minute post partum.

Parameter	Groups of neonates	n	X	o-	m	P
At the first minute	Born by healthy mothers	37	8.03	1.04	0.17	>0.05
	Born by mothers with AS	11	7.76	1.44	0.35	>0.05
At the third minute	Born by healthy mothers	37	8.33	1.23	0.32	>0.05
	Born by mothers with AS	11	8.90	1.30	0.39	>0.05
At the fifth minute	Born by healthy mothers	37	9.11	0.57	0.20	>0.05
	Born by mothers with AS	11	8.86	1.23	0.33	>0.05

Discussion

The results of the conducted study show that in the majority of the women with moderate aortic stenosis and in those with aortic defects, corrected prior to conception, pregnancy, childbirth and the post-partum period were normal. In our study group of pregnant women, there was one woman with aggravated functional class and occurrence of complications. This is in keeping with the findings of other authors [11] and justifies the necessity of regular cardiologic and obstetric monitoring during pregnancy of the women with moderate AS and of those with aortic defects, corrected prior to conception.

In our study, special attention is given to the pregnant women with severe AS, asymptomatic prior to conception. Three women with severe AS and one woman with moderate AS aggravated their functional classes and developed clinical symptoms of left-sided heart failure during pregnancy. Several guidelines and publications have outlined that pregnancy in women with severe AS is related with a serious risk for both the mother and the foetus [5]. In severe AS, the reported maternal mortality varies largely within the

range of 2 - 3% to 17% and a fatal outcome for the foetus may occur in up to 32% [4]. The great differences in maternal mortality may be associated with 1) the small number of pregnant women with AS, involved in the reported series of studies and 2) in most of these studies, the severity of AS has not been evaluated. Currently, there are no adopted criteria to enable the exact prognosis of pregnancy in women with severe asymptomatic AS. In line with the cases of aggravation and occurrence of serious complications in such women, there are cases with favourable pregnancy outcomes [9]. In the medical literature, there are publications, which recommend exercise testing in persons with severe asymptomatic AS [9]. The normal test has been shown to be a guarantee that in the next 12 months the disease will remain asymptomatic. It is known that physical loading in pregnant women may result in bradycardia and ischaemia of the foetus. In severe AS, the cardiac output may decrease even at rest - a fact that gives us grounds to suggest that exercise testing is not safety for both the mother and the foetus in pregnant women with severe asymptomatic AS.

In this study, the incidence of pathological changes in the neonates, born by mothers with AS, is impressive. In the literature, the likelihood of congenital cardiac and body defects and the higher percent of preterm deliveries in women with AS has also been noted [2, 3, 6].

In conclusion, the results of the conducted study confirm the fact that in the majority of the women with moderate aortic stenosis and in those with aortic defects, corrected prior to conception, pregnancy, childbirth and the post-partum period follow a favourable course. These data do not exclude, however, the necessity of cardiologic and obstetric monitoring of these groups of pregnant women, because of possible complications and aggravation of the functional class in isolated cases. The monitored women with severe AS, asymptomatic prior to conception, have developed left-sided heart failure during pregnancy, which is due to the hemodynamic changes normally accompanying pregnancy [12]. In two of the cases treatment-resistant life-threatening ventricular arrhythmias could also be attributed to the physiological changes of the pregnant state such as increased blood volume, cardiac output and heart rate [13].

We consider a need of consensus to evaluate the risk of conception in women with asymptomatic severe AS, and on the other hand assess women with existing pregnancy with unfavorable prognosis for urgent need of stenosis correction.

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