Care of a pregnant woman with aortic stenosis and intrauterine growth restriction – case study

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ABSTRACT

Introduction: Stenosis of the aortic valve is the most common acquired heart defect, which involves reducing the area of this valve. In the case of pregnant women, this defect, due to changes in the cardiovascular system, results in miscarriages, pre-term delivery, or intrauterine growth restriction (IUGR). IUGR is a condition in which the foetus is too small in relation to gestational age, and its consequences may include perinatal hypoxia, meconium aspiration syndrome, or respiratory distress syndrome.

Aim of the study: To analyse the case of a 30-year-old female patient with aortic stenosis and intrauterine growth restriction, diagnosed during pregnancy, as well as to formulate diagnoses and plan nursing and obstetric care for this pregnant woman.

Discussion: The present thesis includes a case study of a pregnant woman with aortic stenosis detected during pregnancy and intrauterine growth restriction. The analysis concerned the patient's planned hospitalisation. The essential elements of hospitalisation included the control of general and obstetric conditions, monitoring of the foetus' condition, as well as pharmacotherapy that aimed at improving the haemodynamic conditions of the pregnant woman.

Conclusions: Narrowing of the aortic valve in pregnant women complicated by the occurrence of IUGR is a rare clinical condition. Providing medical care of such a pregnant woman focuses on the control of general and obstetrical parameters. The participation of a midwife in pharmacotherapy and assisting in the doctor's examinations also constitutes an important element in obtaining information about this medical condition, as well as planning nursing and obstetric care.

Key words: case study, aortic stenosis, obstetric care, intrauterine growth restriction (IUGR).

INTRODUCTION

Aortic stenosis (AS) is an acquired heart defect that occurs when the heart's aortic valve narrows. This impedes the blood flow from the left ventricle to the aorta and further into the arterial system circulation [1]. It is the third most prevalent cardiovascular disease in Western Europe, and the most common acquired valvular heart disease diagnosed within adults [1]. Among people over 65 years, the aortic stenosis is frequently caused by the degenerative-calcifying lesions of the valves, often on common pathogenesis with atherosclerosis. Among adults under 65 years of age, the aortic stenosis may be associated with a congenital defect – most commonly with a bicuspid aortic valve [1, 2]. This defect develops slowly and clinical symptoms increase gradually, which is associated with a number of adaptive changes occurring in the heart.

Aortic stenosis can be asymptomatic for many years. Over time, we can observe occurrence of such symptoms that initially occur only during increased tissue demand for oxygenated blood, e.g. during physical exertion. Later, they are also present while resting, resulting from the reduced amount of blood reaching vital organs (including the brain, heart) and their hypoxia. The characteristic symptoms of aortic stenosis include dizziness, blurred vision, scotoma, fainting, angina – occurring in up to 50% of patients, cardiopalmus, exertional dyspnoea, and dyspnoea at rest [1, 3].

The basic method of diagnosing aortic stenosis is echocardiography, by which we can assess the severity of the defect and its haemodynamic effects. The Doppler study assesses the aortic valve area, indexed in relation to the body surface area, and the velocity of blood flow through the valve. Thus, we can determine the valve's pressure gradients – maximum and

Table 1. Classification of aortic stenosis [5]

Parameter	Aortic stenosis			
	Slight	Moderate	Moderately severe	Severe
V_{max} (m/s)	< 3.0	3.0-3.5	3.5-4.5	> 4.5
Ag_{max} (mmHg)	16-36	36-50	50-80	> 80
Ag_{mean} (mmHg)	< 20	20-35	35-50	> 50
AVA (cm^2)	1.1-1.9	0.9-1.1	0.7-0.9	< 0.7

The velocity of blood flow through the valve (maximum velocity – V_{max}), Ag_{max} – maximal aortic gradient, Ag_{mean} – mean aortic gradient, AVA – aortic valve area.

mean. Valve morphology is also assessed – the number of leaflets, the degree of calcification, and their mobility. Echocardiography determines the dimensions and function of the left ventricle, and assesses the bulbus and ascending aorta [2, 3]. Slight, moderate, moderately severe, and severe aortic stenosis can be identified based on the above-mentioned indicators. A detailed classification of the severity of the disease is provided in Table 1 [1, 3].

Diagnostic methods supplementing the diagnosis of aortic stenosis include the following: physical examination, chest X-ray, computed tomography, and magnetic resonance imaging [2, 3].

Intrauterine growth restriction (IUGR) is an obstetric condition in which the foetus is too small in relation to gestational age. This disorder affects 15-20% of newborns born in developing countries and is a common cause of their increased perinatal mortality (10%) [7]. The mechanisms responsible for the occurrence of IUGR can be divided into several factors: maternal (including maternal cardiovascular disease, e.g. heart defects), foetal, placental, and environmental [8-10]. The basic diagnostic tool used in the detection of IUGR is ultrasonography (USG). This examination detects abnormal growth potential of a foetus whose weight is below the 10th percentile in relation to the gestational age [7-9, 11]. If IUGR is diagnosed, the pregnant woman should be hospitalised in a centre of reference level III. If there is a risk of delivery before 34 weeks of pregnancy, corticosteroids – e.g. Celestone (betamethasone) – should be administered to pregnant women in order to stimulate foetal lung development and its maturation, as well as magnesium sulphate, which has tocolytic properties [8, 9]. Despite the advanced development and availability of diagnostic tests, most IUGR cases (over 50%) are diagnosed only after delivery [8].

AIM OF THE STUDY

The aim of the study is to analyse the clinical case of a pregnant woman hospitalised in the Department of Pregnancy Pathology due to severe aortic stenosis complicated by the occurrence of IUGR of the foetus,

as well as to formulate diagnoses and plan nursing and obstetric care of the pregnant woman.

MATERIAL AND METHODS

The study can be characterised as casuistic. It elaborates on the case of a pregnant woman with aortic stenosis and intrauterine growth restriction. The methods applied in the present research include a case study, and verbal and non-verbal techniques for obtaining information, such as: interview with the patient and medical staff, observation of the pregnant woman, and analysis of medical documentation.

CASE REPORT

A 30-year-old patient (diagnosis of weeks 34 + 2) was referred to the Department of Pregnancy Pathology because of the suspected intrauterine growth restriction of the foetus. The pregnant woman was admitted to the ward in good health. In the opinion of the pregnant woman and the analysis of the pregnancy form, the pregnancy continued in a physiological way until the end of the hospitalisation process. Due to the cardiological load caused by the myocarditis that the patient had in the age of two years and the ablation due to the pre-excitation syndrome (Wolff-Parkinson-White syndrome – WPW syndrome) that occurred in the age of 21 years, the patient was referred to the cardiology outpatient clinic during 32nd week of pregnancy in order to perform echocardiography. The examination showed bicuspid aortic valve and moderate/severe aortic stenosis (Ag_{max}/Ag_{mean} 74/73 mmHg, AVA 0.7-1.2 cm), subject to possible underestimation due to blood volume overload, physiological during pregnancy. Caesarean section was recommended. Another echocardiographic examination confirmed the presence of severe bicuspid aortic valve stenosis.

Upon admission to the Department of Pregnancy Pathology, the patient underwent the physical and obstetric examination. The patient was found to be in a good general condition, with full cardio-respiratory efficiency. General condition parameters were within normal limits. The obstetric examination found one live

foetus in cephalic longitudinal lie. A cardiotocographic (CTG) recording was performed, which found the following: number of foetuses 1, foetal heart rate (FHR) – present, 130 bpm, wavy oscillation. The uterus was not contractile. The vaginal part was preserved, and the external ostium was open to the bulbus. There was no spotting, bleeding, or drainage of the amniotic fluid.

The patient stayed in the Department of Pregnancy Pathology for a period of 14 days. During this time, the following parameters of the general condition were observed and were found to be within the norm. The patient did not report any serious ailments. Within days 3-7 of hospitalisation, the patient experienced symptoms of a genitourinary infection (burning and pain when urinating and vaginal discharge).

The obstetric status monitored on an ongoing basis did not show abnormalities.

Laboratory tests showed slightly lower than normal values of erythrocytes, haematocrit (HCT), and mean concentration haemoglobin (MCH) indicating a slight anaemia. The selected test results were as follows:

– day 0: RBC (red blood cells) – 3.95 × 10^6/µl [N: 4.0-5.0], MCH – 33.4 pg [N: 27.0-31.0],

– day 13: RBC – 3.69 × 10^6/µl, HCT – 34.5%, MCH – 33.9 pg.

The coagulogram showed a reduced APTT level (day 0 – 21.4 s; day 6 – 22.8 s; day 13 – 23.8 s [N: 26.0-36.0]) and elevated fibrinogen concentration (day 0 – 5.2 g/l, day 6 – 4.9 g/l; day 13 – 4.5 g/l [N: 1.8-3.5]).

After two ultrasound examinations, the foetus was found to have retarded development in all of the parameters given (Tables 2 and 3).

Pharmacotherapy during the hospitalisation process was applied in the following way:

– Drug: Polfilina – 2 × 400 mg *p.o.* (Latin: *per os* – orally) – pentoxifylline – facilitates blood flow in the capillaries, reducing blood viscosity and increasing the elasticity of red blood cells;

– Drug: Celestone – 12 mg *i.m.* (Latin: *iniectio intramuscularis* – intramuscularly) – betamethasone. It is used to accelerate foetal lung development and maturation, and to prevent respiratory distress syndrome (vitreous membrane disease) among premature newborns;

– Drug: Monural 1 × 3 g packet *p.o.* – fosphomycin, phosphonic acid derivative – inhibits the process of synthesis of pathogenic microorganisms. It is used for the treatment of acute cystitis, urethritis, and for the prevention of urinary tract infections;

– Drug: Nystatin VP 2 × 100,000 i.u. vaginally – polyene antibiotic with antifungal effect, used in the local treatment of candidal vulvovaginitis [22-25].

Pregnancy was terminated by caesarean section at week 36.

Nursing diagnoses were formulated during hospitalisation. The aims and the plan of nursing and obstetric care for the analysed patient were established.

1. Nursing diagnosis 1: The risk of further intrauterine growth restriction (IUGR) and the occurrence of complications resulting from this condition.

Aim of care: Minimising the risk of further IUGR and thus resulting complications.

Care plan: Constant observation and instructing the patient about the need to inform the medical staff about the occurrence of disturbing symptoms; recommending that the patient track and count foetal movements; performing a CTG recording at least once a day; participation in pharmacotherapy: administration of Polfilin 400 mg *p.o.* in accordance with the individual medical order sheet (IMOS); administration of Celestone in accordance with the individual medical order sheet; assistance during the ultrasound examination by a doctor.

2. Nursing diagnosis 2: The risk of foetal hypoxia due to aortic valve disease of a pregnant woman resulting in uteroplacental insufficiency.

Aim of care: Minimising the risk of foetal hypoxia and providing the right conditions.

Care plan: Observation of the pregnant woman's condition and the control of her vital signs; pulse, arterial blood pressure, skin colour; performing CTG recording at least once a day; recommending that the patient observe foetal movements; recommendation of performing simple exercises in bed to improve circulation; participation in pharmacotherapy according to IMOS; applying oxygen therapy (if necessary); assistance during ultrasonography.

Table 2. Ultrasound examination results from day 0 (weeks 34 + 2)

Indicator	Value	Gestational age according to the last menstrual period (weeks)
BPD	7.54 cm	30 + 2
HC	28.64 cm	31 + 3
AC	25.51 cm	29 + 5
FL	6.30 cm	32 + 4
EFW	1651 g	32 + 4

BPD – biparietal diameter, HC – head circumference, AC – abdominal circumference, FL – femur length, EFW – estimated foetal weight.

Table 3. Results of ultrasound examination – day 7 (weeks 35 + 2)

Indicator	Value	Gestational age according to the last menstrual period (weeks)
BPD	8.35 cm	33 + 4
HC	28.57 cm	31 + 3
AC	28.07 cm	32 + 1
FL	6.09 cm	31 + 4
EFW	1885 g	31 + 5

BPD – biparietal diameter, HC – head circumference, AC – abdominal circumference, FL – femur length, EFW – estimated foetal weight.

3. Nursing diagnosis 3: Anaemia of a pregnant woman caused by an increased need for iron due to advanced pregnancy and an increase in plasma volume.

Aim of care: Improving blood morphotic values and preventing the development of a more severe form of anaemia.

Care plan: Observation and measurement of general condition parameters; controlling blood count indicators; observation of the patient for signs of anaemia; patient's education in proper nutrition; if necessary, iron supplementation with e.g. Tardyferon (80 mg).

4. Nursing diagnosis 4: Potential risk of the patient having a blood clotting disorder caused by pharmacotherapy and limited physical activity.

Aim of care: Preventing the development of coagulation disorders and resulting thromboembolic complications.

Care plan: Observation and measurement of parameters of the general condition, as well as observation of the skin, mucous membranes for the appearance of haematomas, ecchymoses, etc.; informing the patient about the need to report symptoms of haemorrhagic diathesis; controlling blood coagulation rates; recommendation of simple exercises to improve circulation; participation in pharmacotherapy in accordance with IMOS.

5. Nursing diagnosis 5: Risk of early uterine contractions due to urogenital infection.

Aim of care: Reducing the risk of early uterine contractions.

Care plan: Observation and measurement of general condition parameters; instructing the pregnant woman to inform medical personnel about any occurrence of alarming ailments, e.g. lower abdominal pain, backache, and increased abdominal tension; performing a CTG recording at least once a day; participation in pharmacotherapy in accordance with IMOS; assisting during ultrasonography and vaginal palpation by a doctor.

6. Nursing diagnosis 6: Risk of having a premature caesarean section resulting in preterm birth.

Aim of care: Providing the conditions for normal duration of pregnancy and limiting the possible complications of preterm birth.

Care plan: Performing CTG recording at least once a day; informing the patient about the necessity to notify the medical staff about the symptoms of delivery, such as frequent uterine contractions and outflow of amniotic fluid; participation in pharmacotherapy according to IMOS; providing support for the pregnant woman; assistance during ultrasonography performed by a doctor; informing the neonatological staff about the possible necessity of a premature caesarean section.

7. Nursing diagnosis 7: The patient's anxiety about the child's condition and the need for hospitalisation.

Aim of care: Minimising the patient's anxiety and ensuring her sense of security.

Care plan: Observation of the pregnant woman's mental state; providing the patient with understanding and support; encouraging conversation with the obstetrician and neonatologist in order to obtain full information on the state of health of the pregnant woman and her child, as well as to clarify any doubts; encouraging the patient to perform relaxing activities; providing a peaceful environment in the hospital room; enabling the patient to meet with her family.

DISCUSSION

According to the current recommendations regarding the procedure in case of IUGR diagnosis (quoting Huras and Radoń-Pokracka), the patient was referred to a third-level hospital [9]. Ultrasonography, performed during day 0 of hospitalisation (Table 2), showed that the size of the foetus was too small in the case of all parameters tested and in relation to gestational age. According to Jasińska and Wasiluk, the causes of intrauterine growth of the foetus may be maternal heart disease [8]. In the case of the analysed patient, IUGR could be caused by severe aortic stenosis (AVA 0.7-1.2 cm). The treatment of the narrowed aortic valve involves surgical replacement of the affected valve; however, the patient did not receive this type of treatment, due to the high risk of complications, both during and after the procedure [15]. In the case of diagnosing the aortic stenosis of the pregnant woman, Trojnarska *et al.* recommend limiting physical activity and the use of β-blockers [14]. In the case of the patient discussed in this study, pentoxifylline treatment was used to improve foetal-placental circulation. This may have resulted in obtaining inaccurate blood coagulation indexes in the form of a reduced APTT parameter and elevated level of fibrinogen. Ultrasonography performed on the seventh day of hospitalisation (Table 3) shows that this treatment did not bring significant benefits to foetal growth. Before treatment, on day 0 of the patient's hospitalisation (weeks 34 + 2), all foetal growth parameters were reduced by about two to three weeks (Table 2). After applying treatment with pentoxifylline, on the seventh day of hospitalisation, all indicators confirmed the retardation in comparison to the gestational age still in the range of two to three weeks.

Caesarean section was performed before the planned date of delivery, at the 36th week of pregnancy. Due to the ineffectiveness of the applied treatment, which additionally resulted in deterioration of haemostatic blood conditions, and, as recommended by Radoń-Pokracka, Figueras, and Huras, the optimal solution in such a situation seems to be an early termination of pregnancy [7, 9, 19]. This is due to the choice of a lower risk of complications arising from

preterm birth for the child than allowing it stay in the womb until the anticipated date of delivery. In addition, based on the classification of IUGR procedures proposed by Figueras and Gratacos, an AEDV (absent end-diastolic velocity) diagnosis of the umbilical artery qualifies the pregnant woman for caesarean section above the 34th week of pregnancy [19]. The EDV (end-diastolic velocity) measurement at the 35th week of pregnancy obtained a value of 6.70 cm^3/s, as shown by the Doppler ultrasonography, which confirms the diagnosis of AEDV [21]. This corresponds to type II placental insufficiency and clearly indicates the need for premature caesarean section [7, 19].

Disclosure

The authors declare no conflict of interest.

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