Foetal Echocardiography

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Abstract

A modern diagnostic and therapeutical approach to paediatric cardiology enables early application of foetal echocardiography in order of achieving diagnosis of congenital heart anomalies in utero. The aim of this study is to evaluate the precentage of prenatal diagnosis of congenital heart anomalies. This study has been conducted on 73 patients at Paediatric clinic of Clinical Centre of Sarajevo in a period from January 2000 until December 2004 with diagnosis of heart malformations. Among them 14 were preterm newborns, 40 boys. Diagnosis of cardiac anomalies with left to right shunt was done in 56.1%, obstructive 13.7%, cyanotic 1.36% and complex in 28.7% patients. The prenatal diagnosis was esatablished in 4 patients (5.5%) by ultrasound examination which is very low in comparison to other European countries. There is a need for making prenatal diagnosis of congenital heart anomalies in foetus as early as it can be done in order to treat cardiac anomalies in utero, to decraease the number of congenital heart anomalies and to reduce the cost of cardiosurgical and postsurgical treatment.

KEY WORDS: foetal, echocardiography

Introduction

Paediatric cardiology is an exact science thanks to embryological knowledge, morphological anatomy and segmental analysis. Developmental biology from conception to the end of the second month of life allows the solution of morphogenesis (pathogenesis) and etiology of cardiac malformations. Morphological anatomy is essential for the recognition of heart chambers as well as defining the real diagnosis. The language of segmental analysis (1976) allows the recognition of the relation of visceral organs towards the atrium (visceroatrial relation), interrelation of the heart chambers and the relation of the heart towards the great vessels (1). On the basis of segmental analysis it is possible to make an anatomical and physiological diagnosis. Detailed clinical evaluation is essential for patient's judgement with congenital heart anomalies. Congenital heart anomalies are the most frequent diagnosed in the neonatal period. A modern diagnostic and therapeutical approach in paediatric cardiology allows early

application of foetal echocardiography (independently of child's position intrauterine) starting from 18 to 20 weeks of intrauterine life (2). Foetal echocardiograhy offers the possibility of detection of congenital heart anomalies, rhythm disorders and transcatheter therapy of certain lesions and disorders. The aim of this study is to evaluate the precentage of prenatal diagnosis of congenital heart anomalies.

Patients and Methods

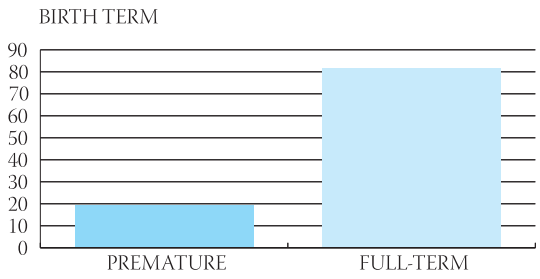
This study was formed of 1885 neonates who were hospitalised at the Paediatric clinic of Clinical Centre Sarajevo during the period from January 2000 until December 2004, at the department of Neonatology and the Cardiology unit. Diagnosis of congenital heart anomalies in 73/1885 (3,8%) patients were obtained by peri, pre and postanal history including family history, physical findings and electrocadiogram, lung and heart X ray, electrocardiogram, echocardiography and laboratory findings. The group was analyzed according to sex, birth weight, weeks of gestation and prenatal diagnosis.

Results

Diagnosis of congenital heart lesion was made in 73/1885 (3,8%) patients. Male newborns were present with 54,8%, preterm in 19,2% patients, which has been shown in Table 1 and Graph 1. The mean body weight was 2900 gr (range from 1000-4800gr).

SEX	NUMBER (N)	PERCENT (%)
MALE	40	54,8%
FEMALE	33	45,2%

TABLE 1. Sex structure of congenital heart lesion's patients

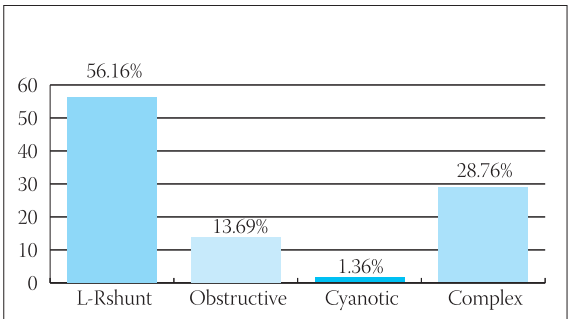


GRAPH 1. Presents that majority of patients were full-term newborns

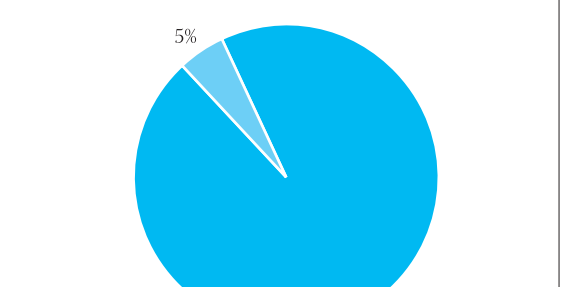
In 15 patients (20,55%) delivery was via sectio caesarea. Graph 2 shows the diagnosis of congenital heart lesions according to groups: with left to right shunt (56,16%), obstructive lesions (13,69%), cyanotic (1,36%) and complex (28,76%) congenital heart anomalies. Positive family history was in 5 patients (6,85%). The prenatal diagnosis has been made via foetal echocardiography in 4 patients (5,2%) (Graph 3).

Discussion

During the last decades of the 20 century with the advent of two dimensional Doppler echocardiography and the refinment of associated technology, a number of paediatric cardiologists and a few obstretricians have begun to focus their attention on prenatal diagnosis of fetal cardiovascular disease (1,3). Cardiac malformations can be detected as early as 16 weeks of gestation (Figure 1). Sequental prenatal examinations of some fetuses are providing new insight into the pathogenesis of certain malformations (4). Progresive deterioration of cer-



GRAPH 2. The structure of congenital heart anomalies



GRAPH 3. Percentage of prenatal diagnosis

tain lesions, such as pulmonic or aortic stenosis, was observed and attributed to abnormal fetal blood flow patterns. Prenatal diagnosis and the successful treatment of fetal supraventricular tachycardia is presently available (4). Fetal surgical interventions (valvotomies) were suggested as feasible and even performed by others. A new branch of " fetal cardiology" is being developed and requieres serious assesment of its impact and scope. The use of prenatal diagnosis of congenital heart disease is somewhat contraversial (5). Pregnancy termination is an option that is offered to the family only in cases of serious malformations. The application of fetal two dimensional Doppler echocardiographic technology will illuminate hitherto unavailable physiologic and anatomic features of the normal human fetal circulation during fetal growth, and will provide important informations regarding cardiovascular functional abnormalities induced by subacute or chronic hypoxia/asphyxia in complicated pregnanicies. It is possible that such abnormalities may be detected well before heart rate disturbances appear, leading to an earlier elective delivery of a newborn who has already been seriously compromised by acidosis and hypoxemia. Fetal echocardiography is an a service which is availble in a vast majority of centres in Europe especially to the mothers who have already had a child with a heart lesion or they themselvs have one. Further indications from the mother's side for foetal echocardiography (FE) are: metabolic disorders in early gestation, exposition to cardiac teratogens (anticonvulsives, lithium, viral infections: rubeola, Coxackie, Cito Megalo Virus, and toxoplasomsis), collagen diseases, mothers with diabetes mellitus or phenilycetonuria or other conditions which increase the risk. Family indications for FE are: father's congenital heart anomalies, a previous child or fetus with congenital heart disease or congenital heart block, chromosomic anomalies, genetic disorders or syndromes with congenital heart lesions or cardiomyopathies. The fetal indications for FE are: suspition for cardiac malformations or foetal hydropns, hydrotorax, polyhidroamnion, extracardiac maloformations (diaphragmal hernia, duodenal atresia) chromosomal abnormalities, arrythmias (bradycardia, tachycardia, ectopic beats), other cases of known risk for foetal heart disease (AV fistula, absence of ductus venosus) and others (6,7). The latest achievment in foetal echocardiography is transtelephonic foetal scanning achived first in 1998 in England which allow each pregnant woman with potential foetal problems medical advice that does not depend where that woman is based during scanning and at the same time protecting her of the potential risk of traveling (3).

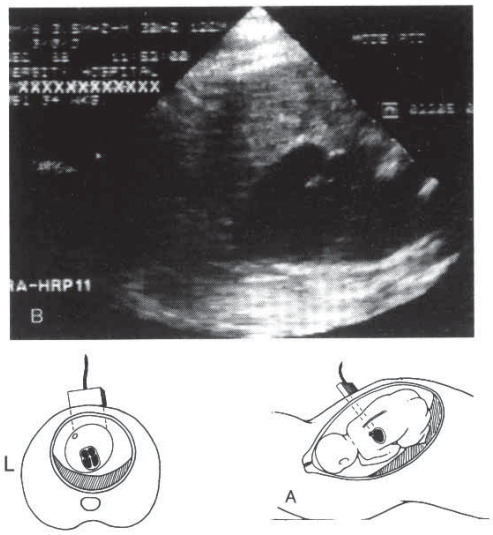


FIGURE 2. The fetus position during scanning (A) with upper spine's direction, (B) echogram of 4 chamber section obtained from posterior side.

In our study the results we got concernig prenatal diagnosis are not in correlation with data from European centers. So in the near future in Bosnia and Herzegovina the aim of paediatric cardiology is to develop fetal cardiology/foetal echocardiography and with it's development the number of congenital heart disease would significantly decrease, the cost of cardiosurgical operations would reduce as well as postsurgical treatment and the cost of rehabilitation of the child's re-inclusion back into normal life. The team for fetal echocardiography should consists of: paediatric-fetal cardiologist, gynecologist, a neonatologist and a cardiosurgeon. In the last few years research in molecular biology and genetics discovered powerfull tools in studying the factors that influence the development of the heart as well as understanding it's structure and functional development. It is possible that understanding these fundaments of normal heart development, will allow further information about pathogenesis of congenital heart anomalies. Having said that the focus of physicians and the healthcare system should not only be aimed for searching for better and higher treatment standards, but the primary aim should be prevention. So, the etiology and pathogenesis of congenital cardiovascular malformations which by the application of imaging techniques in paediatric cardiology is achieved, lead to the ultimate goal; researching the ways of preventing illness and curing it.

Conclusion

Following the trend of modern paediatric cardiology it is necessary to make prenatal diagnosis of congenital heart lessions as soon as possible. The earliest period when that can be done is between 15 and 20 weeks of gestation. In most European countries fetal echocardiography performed in the mid trimester of pregnancy is a part of routine antenatal protection that should be the goal in our country in the years to come.

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