The Turkish Journal of Pediatrics 1999; 41: 349-352 Original

THE ACCURACY OF ANTENATAL FETAL ECHOCARDIOGRAPHY*

*Süheyla Özkutlu MD**, Muhsin Saraçlar MD***

SUMMARY: Özkutlu S, Saraçlar M. (Cardiology Unit, Department of Pediatrics, Hacettepe University Faculty of Medicine, Ankara, Turkey). The accuracy of antenatal fetal echocardiography. Turk J Pediatr 1999; 41: 349-352.

The purpose of this study was to evaluate our experience with a group of patients who were either selected by us or referred by an obstetrician or geneticist with the indication of fetal echocardiography.

This prospective study was done on 128 cases between 1996-1998. Maternal age range was between 16 and 41 years (mean: 28.79). Gestational age range was between 15 and 37 weeks (mean: 26). In the postnatal period the newborn babies were reevaluated for cardiovascular system abnormalities by physical examination, ECG, telecardiogram and, if it was necessary, by echocardiography, cardiac catheterization and angiography. By comparing prenatal and postnatal findings, sensitivity and specificity of fetal echocardiographic diagnosis were determined. Among the total cases studied, nine had major congenital heart disease in postnatal evaluation. Two cases had false negative; there were no false positive prenatal diagnoses. Sensitivity of echocardiographic diagnosis was 100 percent and specificity 78 percent. Three patients had paroxysmal atrial tachycardia and two atrioventricular block. We concluded that the fetal echocardiography is a very useful technique in the evaluation of the fetal cardiovascular system. However, awkward fetal position, severe maternal obesity, and technologic insufficiency of the echo machine may result in unfavorable scanning conditions. Minuteness of anomaly may also result in a false negative prenatal evaluation. *Key words: echocardiography, fetal echocardiography, fetus, congenital heart disease, dysrhythmia.*

Anatomic and functional evaluation of the fetal cardiovascular system has been possible by fetal echocardiography. However, the method may have some limitations pereventing the echocardiographer from detecting some detail. The purpose of this study was to evaluate our experience with a group of pregnant mothers having a child with congenital heart disease or who were referred by an obstetrician or geneticist with the indication of fetal echocardiography.

Material and Methods

This prospective study was done on 128 cases in the Pediatric Cardiology Unit of Hacettepe University. All pregnant mothers were either selected by us or were referred by the Obstetrics and Genetics Departments of the same University with the indication of fetal echocardiography. Standard methods were applied for prenatal cardiovascular system evaluation (I) using a Toshiba Sonolayer SSH-160 A machine. In the postnatal period the newborn babies were reevaluated for cardiovascular system abnormalities by physical examination, ECG,

* From the Cardiology Unit, Department of Pediatrics, Hacettepe University Faculty of Medicine, Ankara.

** Professor of Pediatrics, Hacettepe University Faculty of Medicine.

telecardiogram and, if it was necessary, by echocardiography. Cases without postnatal evaluation were excluded from the study. Newborn babies with congenital heart disease were further evaluated by cardiac catheterization and angiography, if needed. Maternal age range was between 16 and 41 years (mean 28.79). Gestational age range was between 15 and 37 weeks (mean 26). By comparing prenatal and postnatal findings, sensitivity and speificity of fetal echocardiographic diagnosis were determined.

Results

Among the 128 cases included in this study nine had major congenital cardiac anomalies in the postnatal evaluation (Table I). One tetralogy of Fallot, two pulmonary atresia, one atrioventricular (A-V) canal, one transposition of the great arteries (TGA), two single atrium, one large ventricular septal defect (VSD), and one tricuspid atresia were diagnosed. Of those nine patients, two had a false negative evaluation in the prenatal examination: one with pulmonary atresia and one with A-V discordance. None of the cases had a false positive diagnosis. For major lesions, sensitivity of prenatal echocardiographic diagnosis was calculated as 78 percent and specificity 100 percent (Table II).

Table I: Major Cardiac Anomalies

Tetralogy of Fallot	1
Pulmonary atresia	2*
Atrioventricular (A-V) canal	1
Transposition of the great arteries (TGA)	1*
Single atrium	2
Large ventricular septal defect (VSD)	1
Tricuspid atresia	1
Total	9

* one patient with false negative diagnosis.

Table II: Results I

Major cardiac anomalies	9
False negative	2
False positive	0
Sensitivity	78%
Specificity	100%
Dysrhythmias	
Paroxysmal atrial tachycardia (PAT)	3
Atrioventricular (A-V) block	2

The total number of individual cardiac lesions was 19 (Table III). Five patients had VSD. Another five cases of atrial septal defect (ASD) or single atrium, three cases of pulmonary stenosis, and two of pulmonary atresia were diagnosed. The other individual lesions were tricuspid atresia, A-V discordance, A-V canal, and TGA. Among the total 19 individual lesions, four had false negative evaluation (Table IV). No false positive diagnosis was made. The sensitivity of fetal echocardiographic diagnosis was 79 percent and the specificity was 100 percent.

Table III: Individual Cardiac Lesions

Tricuspid atresia	1
Atrial Septal defect (ASD) or single atrium	5
Large ventricular septal defect (VSD)	5
Pulmonary stenosis defect	3*
Pulmonary atresia	2*
Atrioventricular (AV) discordance	1*
Atrioventricular (AV) canal	1
Transposition of the great arteries (TGA)	1*
Total	19

* one patient with false negative diagnosis.

Table IV: Results II

Total individual lesions	19
False positive	0
False negative	4
Sensitivity	79%
Specificity	100%

In five cases, major rhythm abnormalities were diagnosed (Table II). Three patients had paroxysmal atrial tachycardia which was controlled with maternal digoxin administration. In two patients, atrioventricular block was diagnosed. Following birth a pacemaker was implanted in both cases.

Discussion

There is a wide range of accuracy reported in the medicalliterature for fetal echocardiography[2] (Table V). For specificity, it was between 57 and 92 percent for high risk patients. Buskens et al.[3] reported sensitivity as 43 percent and specificity as 95 percent. However, Allan et al.[4] reported sensitivity as 93 percent and specificity as 99.8 percent in their study.

Table V: Results of Various Studies

Ott WJ, 1995[2]	Sensitivity	62%
Buskens et al., 1996[3]	Sensitivity	43%
	Specificity	95%
Allan et al., 1989[4]	Sensitivity	93%
	Specificity	99.8%
Özkutlu-Saraçlar, 1998		
For Major Anomalies		
	Sensitivity	78%
	Specificity	100%
For Individual Lesions		
	Sensitivity	79%
	Specificity	100%

Our experience with detailed fetal echocardiography showed results similar to those listed in the literature (sensitivity 78%, specificity 100%) (Tables II, V).

In conclusion, fetal echocardiography is a very useful technique in the evaluation of the fetal cardiovascular system. However, awkward fetal position, severe maternal obesity, and technical insufficiency of the echo machine may result in unfavorable scanning conditions. Minuteness of anomaly may also result in false negative prenatal evaluation. Small ASD, mild coarctation of the aorta, and mild A-V or semilunar valve abnormalities may be missed during fetal echocardiography. By experience and with the development of computer imaging technology better results will be obtained.

REFERENCES

1. Allan LD, Tynan MJ, Campbell S, et al. Echocardiographic and anatomical correlates in the fetus. Br Heart J 1980; 44: 444-451.
2. Ott WJ. The accuracy of antenatal fetal echocardiography screening in high- and low-risk patients. Am J Obstet Gynecol 1995; 172: 1741-1747.
3. Buskens E, Stewart PA, Hess J, Grobbee DE, Wladimiroff JW. Efficacy of fetal echocardiography and yield by risk category. Obstet Gynecol 1996; 87: 423-428.
4. Allan LD, Chita SK, Sharland GK, Fagg NL, Anderson RH, Crawford DC. The accuracy of fetal echocardiography in the diagnosis of congenital heart disease. Int J Cardiol 1989; 25: 279-288.