

The role of fetal echocardiography in changing prognosis at birth in congenital heart diseases

Eliza CİNTEZA, Assistant Professor, MD, PhD,

2nd Pediatrics Department, "Carol Davila" University of Medicine and Pharmacy, "Alfred Rusescu" Institute for Mother and Child Health, Bucharest, Romania

—◆—

Congenital heart diseases (CHD) represent a group of developmental anomalies. The prevalence of CHD is about 8 %o in live newborns. The high mortality is present especially in countries where the fetal echocardiography is missing. An early cardiac intervention or surgery could save the life but a precise diagnosis is required in many cases before birth. The method is cost effective, although the effort is huge, being necessary a training program, long period of training, prolonged examinations, etc (1). Some studies were published regarding the informational benefit of fetal echocardiography on survival in neonates with CHD for specific lesions (2, 3). The results are ambiguous: some of them showed considerable reductions in early neonatal mortality of CHD (4, 5), but others could not demonstrate that survival and outcome for children with major cardiac defects were better when the defect was known prenatally than if it was detected postnatally (6-9).

The main purpose of prenatal echocardiography is to identify the fetus with complex CHD and improve the outcome by providing an early management and surgery (10). There are particular situations in which the prenatal diagnosis is more than beneficial, like patients with hypoplastic left heart syndrome (HLHS) or other duct-dependent lesions (11) and may experience hypoxic-ischemic insult at presentation (8,9) or patients with transposition of the great arteries (12,13). In these cases by delivering in a high-risk neonatal center and prompt administration of prostaglandin for those who have ductal-dependent circulation, a reduced risk of preoperative hypoxic-ischemia may improve surgical and neurologic outcome.

CHD is the most important cause of infant mortality from congenital malformations in the United States of America and Western Europe. Prenatal diagnosis of congenital heart defects aids treatment coordination and it is cost-efficient (14). All the studies concluded that antenatal diagnosis allows informed decisions about

Address for correspondence:

Eliza Cinteza, MD, PhD, "Alfred Rusescu" Institute for Mother and Child Health, 120 Lacul Tei Blvd., District 2, Bucharest, Romania
email address: elizacinteza@yahoo.com

treatment options, facilitates preoperative care (15) and is life saving in tachyarrhythmias treated in utero (16). Mortality depends on diagnosis, but medium term outcome for survivors is good in all patients with prenatal diagnosis in all studies.

Fetal echocardiography had 95.2% sensitivity, 99.5% specificity, 99.0% positive predictive value and 97.6% negative predictive value for CHD (17).

In the developed countries the fetal ultrasound screening for congenital heart diseases is increasing, although is not easy and the detection rate is not homogenous in all regions (10, 18). There are differences between gynecologist and pediatric cardiologist (19) evaluation but finally good comparisons are reported (20). There is a tendency with good results for fetal screening by the gynecologist and reevaluation by the pediatric cardiologist in specific cases. Regarding the impact of fetal echocardiography it is not yet accepted world wide, the positive role not only on neurological development but also on postoperative survival. Important differences are reported between centers.

The training program for fetal echocardiography in Europe starts after becoming a pediatric cardiologist in a recognized University center. This program consists in performing fetal echocardiographic scans in a tertiary level department of perinatology or fetal cardiology at least 100 normal examinations, 20 examinations of CHD under supervision and 50 examinations off-line (1).

In developing countries this method is a luxurious one because there are no centers for teaching fetal echocardiography and all the specialists learnt in western countries in training period. The fetal echocardiography is sporadically performed and only at a basic level. In many European countries, like Romania, the

Pediatric Cardiology specialty is not any more recognized, although there is a global tendency to have more specific diagnosis and specialists. Only few studies but large (on 883 fetuses with CHD) from Eastern Europe can provide important information about prenatal echocardiography and prognosis in CHD (21).

The proper diagnosis of a CHD in a fetus may have dramatic consequences. The pregnancy could end with termination, death in utero, neonatal death, or stillbirth.

There are many studies concluding that prenatal diagnosis end up with a reduced preoperative mortality. But this depends very much on the specific pathology studied. The need for a prenatal diagnosis might indicate a specific center for delivery where urgent balloon atrioseptostomy or other specific techniques also might be performed, being mandatory in some of the patients. Fetal assessment of the foramen ovale size or restrictive function in fetuses might improve the postnatal care and even modifications of delivery conditions. □

CONCLUSION

Although the fetal echocardiography may increase the survival and decrease the risk of comorbidities for neurological lesions all this effort is useless without a cardiovascular surgery center for neonates ready to take care of them.

It can be discussed about cost-efficiency in developed countries, where the results of this examination are useful in immediately after birth preoperative evaluation.

The impact of this method in changing prognosis depends on the skills of the gynecologist and the pediatric cardiologist who are performing the examinations. There is long training period in developed countries dedicated only to fetal echocardiography. □



REFERENCES

1. Allan L, Dangel J, Fesslova V et al – Recommendations for the practice of fetal cardiology in Europe. *Cardiol Young* 2004; 14:109-114
2. Respondek M, Kaczmarek P, Pertynski T – Fetal echocardiography guidelines to predict survival of fetuses with ascites. *Ultrasound in Obstetrics and Gynecology* 2003; 7(4):256-261
3. Gelehrter S, Owens ST, Russell MW et al – Accuracy of the Fetal Echocardiogram in Double-outlet Right Ventricle. *Congenital Heart Disease* 2007; 2(1):32-37
4. Khoshnood B, De Vigan C, Vodovar V et al – Trends in prenatal diagnosis, pregnancy termination, and perinatal mortality of newborns with congenital heart disease in France, 1983-2000: a population-based evaluation. *J Gynecol Obstet Biol Reprod (Paris)* 2006; 35(5 Pt 1):455-464
5. Franklin O, Burch M, Manning N et al – Prenatal diagnosis of coarctation of the aorta improves survival and reduces morbidity. *Heart* 2002; 87(1): 67-69
6. Nikkilä A, Björkhem G, Källén B – Prenatal diagnosis of congenital heart defects – a population based study. *Acta Paediatr* 2007; 96(1):49-52
7. Montaña E, Khoury MJ, Cragan JD et al – Trends and outcomes after prenatal diagnosis of congenital cardiac malformations by fetal echocardiography in a well defined birth population, Atlanta, Georgia, 1990-1994. *J Am Coll Cardiol* 1996; 28(7):1805-1809
8. Mahle WT, Clancy RR, McGaurn SP et al – Impact of prenatal diagnosis on survival and early neurologic morbidity in neonates with the hypoplastic left heart syndrome. *Pediatrics* 2001; 107(6):1277-1282
9. Satomi G, Yasukochi S, Shimizu T et al – Has fetal echocardiography improved the prognosis of congenital heart disease? Comparison of patients with hypoplastic left heart syndrome with and without prenatal diagnosis. *Pediatr Int* 1999; 41(6):728-732
10. Simpson JM – Impact of fetal echocardiography. *Ann Pediatr Card* 2009; 2(1):41-50
11. Jaeggi ET, Sholler GF, Jones OD et al – Comparative analysis of pattern, management and outcome of pre-versus postnatally diagnosed major congenital heart disease: a population-based study. *Ultrasound Obstet Gynecol* 2001; 17(5):380-385
12. Kumar RK, Newburger JW, Gauvreau K et al – Comparison of outcome when hypoplastic left heart syndrome and transposition of the great arteries are diagnosed prenatally versus when diagnosis of these two conditions is made only postnatally. *Am J Cardiol* 1999; 5; 83(12):1649-1653
13. Bonnet D, Coltri A, Butera G et al – Detection of transposition of the great arteries in fetuses reduces neonatal morbidity and mortality. *Circulation* 1999; 99:916-918
14. DeVore GR – Influence of prenatal diagnosis on congenital heart defects. *Ann N Y Acad Sci* 1998; 18:847:46-52
15. Andrews R, Tulloh R, Sharland G et al – Outcome of staged reconstructive surgery for hypoplastic left heart syndrome following antenatal diagnosis. *Arch Dis Child* 2001; 85(6):474-477
16. Fesslová V, Villa L, Kustermann A – Long-term experience with the prenatal diagnosis of cardiac anomalies in high-risk pregnancies in a tertiary center. *Ital Heart J* 2003; 4(12):855-864
17. Khoo NS, Van Essen P, Richardson M et al – Effectiveness of prenatal diagnosis of congenital heart defects in South Australia: a population analysis 1999-2003. *Aust N Z J Obstet Gynaecol* 2008; 48(6):559-563
18. Ganesh Acharya, Vassilis Sitras, Jan Martin Maltau et al – Major congenital heart disease in Northern Norway: shortcomings of pre- and postnatal diagnosis. *Acta Obstet Gynecol Scand* 2004; 83(12):1124-1129
19. Acherman RJ, Evans WN, Luna CF et al – Prenatal detection of congenital heart disease in southern Nevada: the need for universal fetal cardiac evaluation. *J Ultrasound Med* 2007; 26(12):1715-1719
20. Meyer-Wittkopf M, Cooper S, Sholler G – Correlation between fetal cardiac diagnosis by obstetric and pediatric cardiologist sonographers and comparison with postnatal findings. *Ultrasound Obstet Gynecol* 2001; 17(5):392-397
21. Dangel J, Kordon Z, Kaplanska A et al – Evaluation of fetal echocardiography and postnatal follow up in 110 fetuses with hypoplastic left heart syndrome – single reference fetal cardiology center experience. 5th World Congress of Paediatric Cardiology and Cardiac Surgery, June, Cairns, Australia, poster