# Screening of fetal congenital heart disease: the challenge continues

***Rastreamento das doenças cardíacas congênitas fetais: o desafio continua***

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Congenital heart disease (CHD) is the most common congenital malformation [1] in fetuses. It affects eight per 1,000 live births and is more common antenatally [2-5]. In beginning, cardiac evaluation was confined to pregnancies at increased risk of CHD, such as those with a family history of CHD or where extracardiac malformations had been detected. However, up to 86% of CHD occurs in pregnancies where there are no known high risk features [6], emphasizing the need for an effective fetal cardiac screening program for all pregnancies [7,8]. For this reason, in the mid 80's started the idea of teaching the obstetrician to assess the heart in a simplified form during routine obstetric scanning [9,10].

Four chamber view scanning became an integral part of the fetal anatomical survey in many countries by the end of the 1980s [9,10]. However, prenatal screening based on visualization of the four-chamber view has much lower sensitivity [6,11]. This is partly because the four-chamber view may appear normal in cases of many anomalies, such as transposition of the great vessels, tetralogy of Fallot, double outlet right ventricle, truncus arteriosus, pulmonary or aortic stenosis/atresia and coarctation of the aorta. Anomalies of the great vessels are associated with an abnormal four-chamber view in 30% of cases [12].

When four-chamber and great vessels view are examined, the sensitivity of ultrasound screening for congenital heart defects increases from approximately 30% to 69–83% [6,11,13]. Therefore, we support the idea of evaluation both the four-chamber view and the outflow tracts (Figure 1). Then, we could improve the rate of prenatal detection of congenital heart disease.

In 2006, the International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) published a guideline in which they described the "basic" and "extended basic" cardiac ultrasound examinations [14]. The intention was to standardize the assessment and to maximize the detection of heart anomalies during the second-trimester scan (Figure 1). However, we agree that a comprehensive fetal echocardiography should be performed when heart anomalies are suspected. One of the problems to follow this guideline is the difficulty of obtaining images of the outflow tracts.

This happens because unlike the four-chamber view, the aorta and pulmonary artery do not lie in a single axis. In

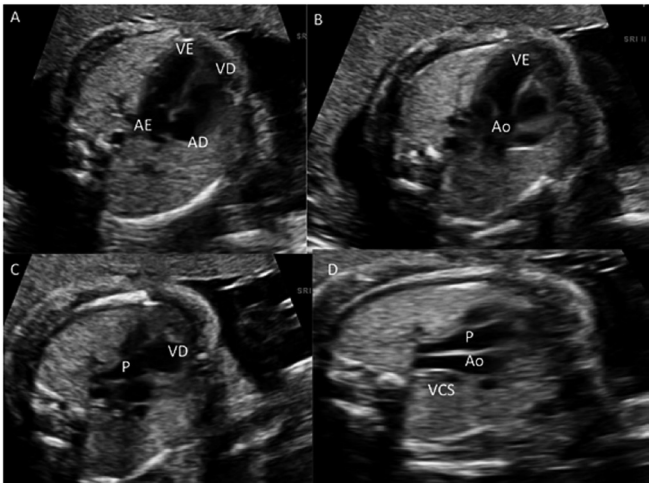


*Fig. 1 - Images for evaluating the fetal cardiac screening by two-dimensional ultrasound. A: four-chamber view of the fetal heart. B: left ventricular outflow tract (LVOT). C: right ventricular outflow tract (RVOT). D: three-vessel view of the fetal heart. LV: left ventricle. RV: right ventricle. LA: left atrium. RA: right atrium. P: pulmonary artery. Ao: aorta. SVC: superior vena cava*

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compliance to DeVore study [15], we state that it is necessary experienced hands to view the outflow tract. Accordingly, it is important additional training.

The development of new technologies is gaining strength as they; theoretically, facilitate the evaluation of the fetal heart exam including the outflow tracts. Four-dimensional ultrasonography (4DUS) with spatio-temporal image correlation (STIC) technology allows the acquisition of a volume dataset from the fetal heart, and displays a cineloop of a complete single cardiac cycle in motion. Moreover, STIC offers the advantage of offline assessment of cardiac structures, connections, and functions [16-18] (Figure 2).

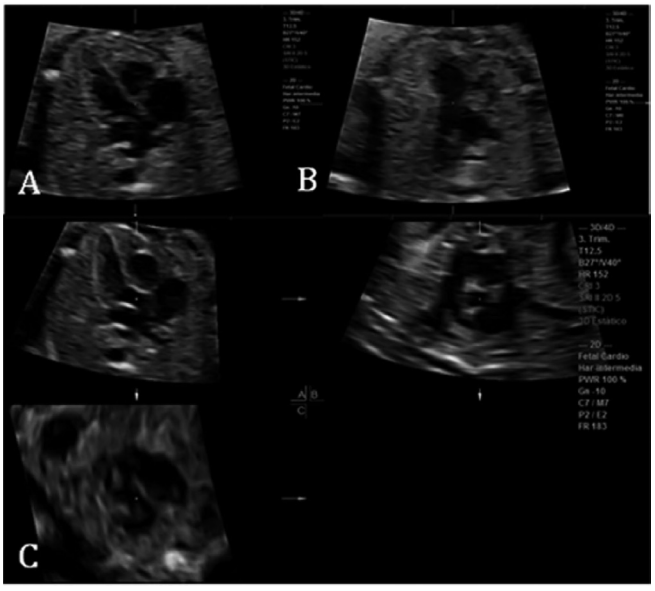


*Fig. 2 - Images for evaluating the fetal cardiac screening by four-dimensional ultrasonography with spatiotemporal image correlation (STIC) by multiplanar mode. A: four-chamber view of the fetal heart. B: three-vessel view of the fetal heart. C: left ventricular outflow tract (LVOT) and right ventricular outflow tract (RVOT)*

The STIC technology has several tools to analyze all cardiac structures: dynamic multiplanar mode, render mode, omni view, M mode, volume analysis, tomographic ultrasound imaging (TUI). These are new technologies that are still in development and in study.

Despite the great efforts made so far, the STIC is still considered an additional method in echocardiography and, rarely, they are available in daily practice. There are many inherent difficulties in obtaining adequate cardiac images in a STIC [16], for example: the fetal position may vary during the exam; fetal movement during the acquisition of the volume; higher maternal body mass indices or oligohydramnios may make images more difficult and acquiring the images of the heart can be time consuming.

However, we believe that the new methods will be very useful for tracking in the future. Technology tends to advance and sensitivity of this new method will continue improving. Thereby, the 3D/4D technology allows for a more comprehensive and practical assessment of CHD in the fetus.

Antenatal screening can offer a number of benefits. The identification of CHD can facilitate early therapy and to prevent a cardiac decompensation. Other benefits include opportunities to counsel parents, to screen for co-existing abnormalities, to plan peripartum management and intrauterine intervention in some cases. In severe cases, some patients choose for termination of pregnancy. Ultimately, the increased detection rates of congenital heart disease reduce perinatal morbidity and mortality. We believe that adequate training associated with a proper use of new technologies may improve the rate of diagnose CHD.

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