Possibilities of prenatal diagnostics of severe congenital heart disease

A qualitative and quantitative real-time two-dimensional echocardiographic study

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New high resolution real-time cross-sectional ultrasound imaging systems enabled us to evaluate normal fetal cardiac anatomy in detail. Over a period of two years 119 fetuses were imaged successfully and reexamined after birth.

The estimated fetal age varied from 20 - 41 weeks (mean 32 ± 0.5 S.E. weeks) of pregnancy. The estimated fetal weight varied from 500 - 3150 grams (mean 1610 ± 85 S.E. grams). To document fetal cardiac anatomy, we reproduced commonly used cross-sectional views of the heart. Most useful for cardiac evaluation have been the four-chamber view (Fig. 1) and the short axis great vessel orientation views (Fig. 2), which could be obtained in 96 % and 91 % of the patients respectively. Cardiac structures such as ventricular walls, ventricular and atrial septae, AV-valves, foramen ovale, four-chambers as well as two great arteries with a spiral relationship (in 91 %) could always be imaged in detail satisfactorily. The examination was extended to the aortic arch and a.o. descendens (88 % visualized) as well as to the v. cavae (86 % visualized) (Fig. 3). Having examined all fetuses after birth, we can verify that we have not missed any cardiac malformation. A coarctation of the aorta was detected recently.

There is no doubt that certain congenital cardiac malformations can be diagnosed or excluded before birth by real-time cross-sectional ultrasonography. Diagnoses such as hypoplasia of the right or left ventricle as well as transposition of the great arteries should be detectable before birth. Moreover there is a good chance that malformations as AV-canal, single ventricle and truncus arteriosus communis or tetralogy of Fallot could be seen by ultrasound.

Finally the study allowed a quantitative evaluation of the fetal heart during the second half of pregnancy. Growth curves for left and right ventricle and total cardiac dimension as well as great artery size were derived from diastolic measurements. The physiologic changes of the circulatory system after birth were evaluated, but cannot be discussed here. As an example may be

presented RV/LV dimensional ratio in the four-chamber hemiaxial presentation: This ratio decreased significantly within 36 hours after birth: 1.18 ± 0.01 S.E. to 0.99 ± 0.03 S.E., $p < 0.002$.

Ref. 1. Sahn DJ, Lange LW, Allen HD, Goldberg SJ, Anderson C, Giles H, Haber K: Quantitative real-time cross sectional echocardiography in the developing normal human fetus and newborn. *Circulation* 62: 588, 1980

Ref. 2. Lange LW, Sahn DJ, Allen HD, Goldberg SJ, Anderson C, Giles H: Qualitative real-time cross sectional echocardiographic imaging of the human fetus during the second half of pregnancy. *Circulation* 62: 799, 1980

Figure 1

Figure 2

Figure 3