Sonographic Indications of Fetal Chromosome Abnormalities

„Genetic ultrasound" is a refined technique in prenatal diagnostics. It aims to estimate as accurately as possible and non-invasively, the individual risk of a fetal chromosome abnormality. In conventional prenatal sonography (malformation screening) conspicuous fetal malformations are searched for selectively; naturally chromosomal anomalies of the fetus cannot be detected in this case. On the other hand chromosome abnormalities are ruled out or detected by prenatal invasive methods, such as amniotic fluid puncture while structural fetal malformations are not detected. However, every invasive diagnosis carries a certain risk of complications (miscarriage, hemorrhages, pains).

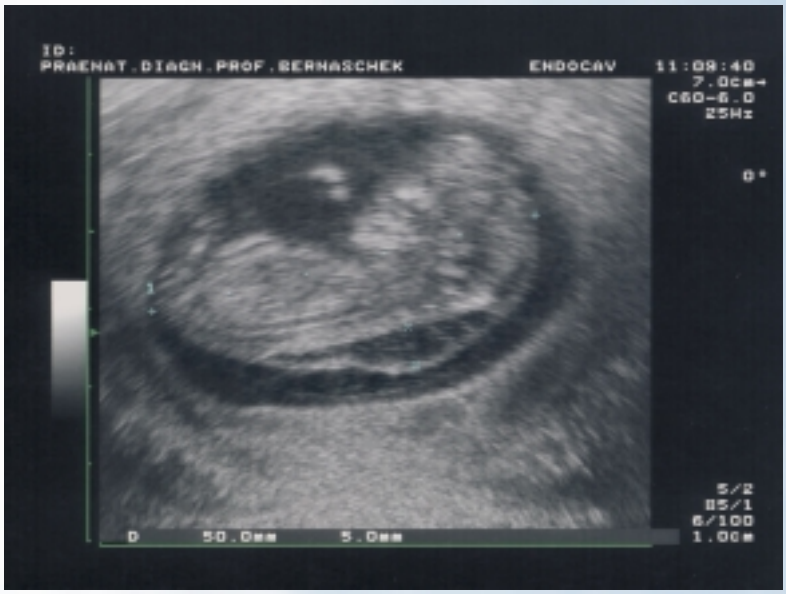
Prof Dr
Barbara Ulm

These risks must be weighed against the potential benefits of the puncture (chromosomal diagnosis). Genetic ultrasound, the search for or the exclusion of sonographic markers of fetal chromosome abnormalities, serves to accurately define this risk-benefit relationship for the individual case, going beyond pure malformation screening. On the basis of this "genetic" ultrasound the child's parents can decide individually for themselves and for their child – and not related to generalizing statistics – whether they want to have a prenatal invasive intervention performed for karyotyping or not.

A large number of sonographic markers have been described, evaluated and partially also qualified in their meaning in recent years. A common feature of all markers is that they describe functionally mostly insignificant anomalies of the fetus, which in part can be detected sonographically only at a certain fetal age. Some markers also indicate with a normal set of chromosomes an increased risk of other malformations of the fetus (e.g. increased nuchal translucency heart defect).

So-called "soft markers", about which a keen scientific discussion is going on, and in which additional "risk factors", such as the maternal age or the result of a triple test, give more weight to the indication for prenatal karyotyping, differ from "safe" sonographic markers, which have been evaluated sufficiently and in a very large number of cases, and which call for even younger expectant mothers to undergo prenatal invasive examination (e.g. increased nuchal translucency > 3mm, hygroma coli).

In principle the maternal age (basic risk), an anamnesis possibly indicating hereditary defects (earlier trisomy = 3 times increased basic risk) and the current fetal age (earlier gestational age = higher probability of a chromosome abnormality, since more spontaneous abortions with chromosomally abnormal fetuses) influence every risk estimate for a fetal chromosome abnormality. In addition there is a distinction between "isolated"

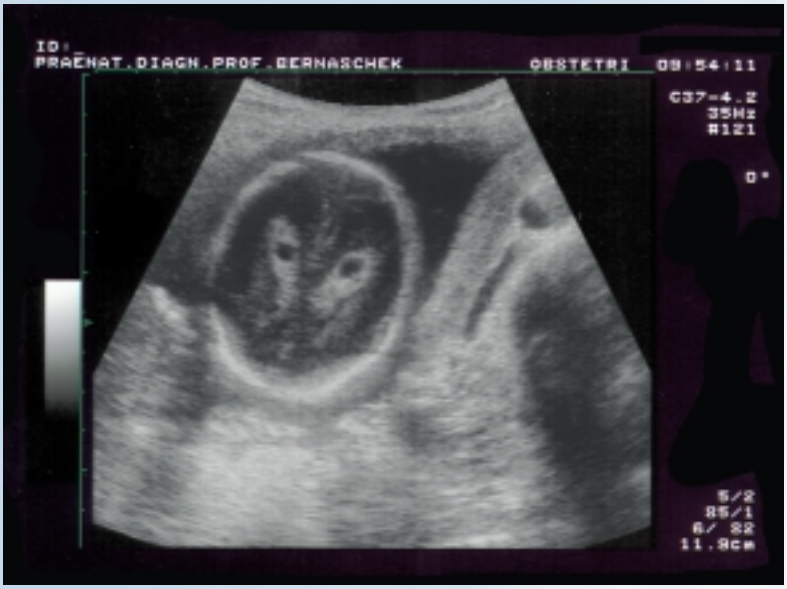


Increased nuchal translucency (week 12)

and "combined" markers: on detection of an isolated sonographic marker for fetal chromosome abnormalities no further ultrasound anomalies are found at the time of diagnosis (typically for trisomy 21: in 85% of the cases only one sonographic marker can be displayed). With "combined" markers other US anomalies, malformations or markers are found simultaneously (frequently in trisomy 18 or 13, Turner syndrome, triploidy). In any event, with the combined appearance of markers or on detection of a structural malformation and an additional marker, a higher probability of a chromosome abnormality can be expected - a fact which will not insignificantly influence the consultation with the child's parent and the decision pro/contra invasive diagnostics.

There is much discussion – not always with propitiously chosen words and not always on the basis of scientifically tenable data – concerning the sense and value of screening for sonographic markers for fetal aneuploidy. Whoever understands and/or misinterprets the sonographic markers as a need to refer even more women than previously to prenatal invasive karyotyping departs from the realm of profitable academic discussion. Especially with the assistance of these markers, not more but fewer women should have to accept the risk of an amniotic fluid or placenta puncture. Whereas 10 to 15 years ago only the maternal age, above a limit of around 35 years, was considered as risk indicator for fetal aneuploidy and thus as standard or cut-off level for the consultation between gynecologist and expectant mother, the risk-benefit analysis is now made on an individual basis. Expressed otherwise: the exclusion of markers indicates a 50% lower risk of a fetal chromosome abnormality than would be expected solely because of age and/or anamnesis.

The majority of children, and thus also of children with trisomy, are born to women under 35. In this group of expectant mothers, some will be found who have a prenatal invasive examination performed on the basis of an abnormal marker screening result, which in turn results in a certain percentage in an abnormal fetal chromosomal diagnosis. The reduction of the frequency of punctures in women above 35 on the basis of a normal marker screening result is just as significant, and this cannot be emphasized often enough. Naturally, however carefully performed, no marker screening replaces the consultation between the child's parents and the physician and examiner, for only the expectant mother herself or the couple can and should decide whether a puncture – which is never without risk ! – comes into question for them or not.



Bilateral choroid plexus cysts (week 20)

Frequent sonographic markers for fetal chromosome abnormalities

Marker	Rate of female chromosome abnormalities in isolated apperance	combined apperance
Increased nuchal translucancy > 3mm (week 11-14)	29 %	29 %
Hygroma colli	50 %	70 %
Early growth retardation (< week 20)	approx. 5 %	40 %
Choroid plexus cysts (bilateral)	0.6 – 1.5 %	4.5 – 45 %
Posterior-fossa-cysts	50%	50%
Echogenic intracardiac focus	0 – 1.2 %	up to 12 %
Echoic intestine	up to 7 %	up to 46 %
Ventricular enlargement (10-15 mm)	2 %	17 %
Bil. pyelectasia	2-3 %	up to 30 %
Single umbilical artery (SUA)	0-2 %	20 – 30 %
Umbilical cord cyst	7 %	55 %

Please address correspondence to:
Prof Dr Barbara Ulm
University Clinic
for Frauenheilkunde,
Clinical Department
for Prenatal Diagnostics
and Therapy
Director:
Prof Dr Gerhard Bernaschek
Währinger Gürtel 18-20
A- 1090 Wien
Tel.:0043-1/40400-2994