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FUNDAMENTALS OF EARLY FETAL ULTRASOUND SCREENING

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Abstract:

Ultrasound examination of the fetus in the first trimester of pregnancy. In 95% of cases, measurements can be performed using transabdominal scanning; in other cases, transvaginal ultrasound may be required. Equipment should be at least mid-range, preferably with a cineloop mode and the ability to measure tenths of a millimeter. An average examination time of at least 10 minutes allows for confirmation of fetal viability, determination of the number of fetuses, accurate gestational age, detection of gross developmental anomalies, and allows for measurement of the nuchal fold, which, in combination with maternal age, is an important component of screening, allowing for the detection of certain chromosomal abnormalities in early pregnancy with up to 75% accuracy.

Keywords: fetus, ultrasound imaging, first trimester, screening

In the first trimester of pregnancy, ultrasound examination should be performed using transabdominal and/or transvaginal transducers. Higher-frequency transducers are preferred due to their higher resolution. Whenever possible, the radiation power should be reduced, but without sacrificing image quality. Basic principles/preferred examination order: 1. Uterus and appendages. 2. Fetal sac. 3. Fetal mobility. 4. Cardiac activity. 5. Fetal head. 6. Chest. 7. Neck. 8. Anterior abdominal wall. 9. Internal organs (stomach, bladder). 10. Upper and lower extremities.

Uterus and appendages

Abnormalities in the shape, location, and structural features of the myometrium should be reflected in the report. Ovaries - structure, presence of lesions (normally, the corpus luteum is visualized - shape and echostructure are variable, size up to 30 mm). The adnexal area as a whole - exclusion of ectopic pregnancy, the presence and amount of free fluid in the retro-uterine space. The gestational sac The gestational sac is reliably visualized from 4-5 weeks of pregnancy, preferably by transvaginal ultrasound (US). If the gestational sac is visualized in the uterine cavity, but there is no embryo, other fluid formations in the uterine cavity must be excluded. Attention should be paid to the echogenic outline of the trophoblast and the yolk sac (visualized from 5 weeks of pregnancy) and it should be ensured that the contents of the gestational sac are anechoic. If the gestational sac is not visualized, and the patient is confident that she is pregnant, the uterine adnexa should be carefully examined for an ectopic pregnancy (highly preferably transvaginally). Cardiac activity Using a high-frequency transvaginal sensor, the heartbeat is often detected from 6 weeks of pregnancy (CRL = 2 mm), but may not be detected until CRT = 3-4 mm. The rhythm and frequency of the heartbeat are assessed. Number of Fetuses: A multiple pregnancy is diagnosed by visualizing more than one gestational sac and several embryos. Between 11 and 14 weeks of gestation, monochorionic twins can be reliably differentiated from dichorionic twins. In dichorionic twins, the area of placental tissue extension to the base of the amniotic septum separating the fetuses is determined (the so-called lambda sign). Non-viable pregnancy: The diagnosis can be made in the presence of one or both of the following signs (using a high-quality transvaginal probe): 1. No visualization of the embryo in a gestational sac with a diameter of 20 mm or more. 2. Visualization of an embryo with a CRL of 6 mm or more, but without signs of cardiac activity (the cardiac area should be examined for at least 30 seconds).

If a non-viable pregnancy is suspected, but the physician lacks experience in making this determination, lacks access to high-quality equipment, or has doubts about the viability of the embryo, a combined examination or a follow-up examination after 1 week should be recommended (5). Anterior Abdominal Wall and Abdominal Cavity: Physiologic omphalocele is most pronounced at the beginning of the 10th week of pregnancy; then, from 10 weeks 4 days to 11 weeks 5 days, intestinal loops return to the abdominal cavity (1). Visualization is considered acceptable up to 14 weeks of pregnancy. In the first trimester, the fetal stomach is usually visualized (in 75% of cases, visualization of the stomach is possible up to 10 weeks); sometimes, the esophagus can be visualized as two echogenic bands anterior to the aorta. Hyperechoic intestine is detected in 0.5% of cases - usually has no pathological significance, a common cause is intra-amniotic hemorrhage, but may be a marker of chromosomal pathology. Megalocystis is an enlargement of the urinary bladder of more than 8 mm, tactics - a control examination, if more than 13 mm, then a decision on

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termination of pregnancy. Kidneys and adrenal glands of the fetus The kidneys and adrenal glands begin to be visualized from the 9th week of pregnancy, in most cases (99%) they are reliably determined from the 12-13th week both during transabdominal and transvaginal examination (4). The echogenicity of the parenchyma at 9 weeks is increased, decreasing as pregnancy progresses. Brain structures In a normal fetus, the contours of the lateral ventricles, choroid plexuses and median echoline (interhemispheric fissure) are visualized from the 9th week of pregnancy. At 10-11 weeks of pregnancy, the third and fourth ventricles are visible. From 12 weeks, the cerebellum and thalamus can be visualized. The choroid plexuses are visualized as homogeneous echogenic structures, almost completely symmetrically filling the cavities of the lateral ventricles. Their width increases from 2 mm at 10 weeks to 5 mm at 13 weeks. The ratio of the lateral ventricle width to the hemisphere width decreases from 72% at 12 weeks, 67% at 13 weeks, to 61% at 14 weeks. The transverse diameter of the cerebellum increases linearly from 6 mm at 10 weeks to 12 mm at 14 weeks.

Acrania/Anencephaly

Prenatal ultrasound diagnosis of anencephaly in the second and third trimesters of pregnancy is based on the detection of the absence of the cranial vault bones and cerebral hemispheres. At 10-11 weeks of pregnancy, as noted by some authors, this diagnosis can sometimes be difficult. As pregnancy progresses, the pathological process progresses: acrania > exencephaly > anencephaly. In the first trimester of pregnancy, acrania is a pathognomonic sign; the brain may be either normal or somewhat deformed (4). Encephalocele is a skull defect with a protrusion of the meninges (meningocele) and brain tissue (encephalocele). In 75% of cases, the defect is observed in the occipital region, less commonly in the frontal-ethmoid and parietal regions. It is often associated with microcephaly, hydrocephalus, spina bifida, and Meckel-Gruber syndrome. A prerequisite for diagnosing encephalocele is visualization of a cranial bone defect; therefore, it cannot be identified until the onset of cranial ossification, which occurs at 10 weeks. The presence of a bone defect allows one to differentiate an occipital encephalocele from a cervical cystohygroma. Principles of nuchal fold measurement: In 1866, Langdon Down first noted that patients with trisomy 21 had the appearance of excess skin—"the skin appears too large for their body." In the 1990s, it was discovered that ultrasound examination in fetuses with Down syndrome can detect excess skin as increased nuchal translucency (NT) during the first 3 months of intrauterine life. In addition to the high role of NT in identifying the risk of Down syndrome, an increased NT may highly indicate other chromosomal abnormalities and may be associated with severe heart and great vessel defects, a wide range of skeletal dysplasias, and hereditary syndromes. Possible mechanisms for an increased NT include: 1. Heart failure. 2. Venous congestion in the vessels of the head and neck due to compression of the superior mediastinum. 3. Impaired formation of intercellular substance. 4. Abnormal or delayed development of the lymphatic system. 5. Impaired lymphatic drainage due to weakened fetal movements. 6. Fetal anemia and hypoproteinemia. 7. Intrauterine infection.

Criteria/Rules

1. The examination is performed between 11 weeks and 13 weeks 6 days of gestation (CRL from 38 to 78 mm). The success rate at this stage of pregnancy reaches 98-100%, but at 14 weeks it drops to 90% due to the difficulty of performing the measurement due to the more vertical position of the fetus (9). 2. The results of transvaginal and transabdominal scanning are similar, but reproducibility may be higher with a transvaginal examination (2). 3. The measurement is performed in the midsagittal plane of the fetus, as for CRL measurement. 4. The fetal image should occupy 3/4 of the image, with the magnification selected such that a minimal change in the distance between the calipers results in a 0.1 mm change in the distance between the calipers (3). 5. The amnion should be visualized separately from the fetal skin. At this stage, both structures are visualized as thin membranes, which can lead to false results. It is necessary to wait for spontaneous fetal movement, ask the pregnant woman to cough, or rhythmically press on the anterior abdominal wall. This will cause the fetus to "separate" from the amniotic membrane. 6. The caliper should be positioned along the inner surface of the "cervical fold" being measured, at the point of maximum thickness of the anechoic zone between the skin and soft tissues behind the cervical spine. Several measurements are taken during the examination, and the maximum is recorded in the examination protocol. 7. The fetus should be in a neutral position. If the fetal neck is extended, the value may increase to 0.6 mm; if the neck is flexed (in the sagittal plane), the value may decrease to 0.4 mm. (8) 8. The umbilical cord may be located around the fetal neck (5-10%), leading to falsely elevated values (on average +0.8 mm)(8). In such cases, the NT values above and below the umbilical cord are different, and it is more correct to use the lower value when calculating the risk. 9. If the measurement conditions are met and an increased NT is detected, monitoring is not recommended. Nasal bone Visualization rules: 1. At high magnification on the sagittal scan (visualization capability in a normal fetus is up to 95.5%). 2. Two echogenic stripes are visualized in the nasal area - one of them is an echo signal from the nasal skin, the second, located deeper, is an echo

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signal from the nasal bones. 3. The nasal bone first begins to be visualized at a CRL of 42 mm. 4. In fetuses with Down syndrome, the lack of visualization of the nasal bone is probably associated with its hypoplasia or late ossification (6).

LITERATURE

1. Braithwaite JM, Armstrong MA, Economides DL. Assessment of fetal anatomy at 12 to 13 weeks of gestation by transabdominal and transvaginal sonography.// Br. J. Obstet. Gynaecol.- 1996.- Vol.103.- P.82-85.
2. Braithwaite JM, Economides DL. The measurement of nuchal translucency with transabdominal and transvaginal sonography - success rates, repeatability and levels of agreement.// Br. J. Radiol.- 1995.- Vol.68.- P.720-723.
3. Braithwaite JM, Morris RW, Economides DL. Nuchal translucency measurements: frequency distribution and changes with gestation in a general population.// Br. J. Obstet. Gynaecol.- 1996.-Vol.103.- P.1201- 1204
4. Campbell S, Holt EM, Johnson FD. Anencephaly: early ultrasonic diagnosis and active management.// Lancet.- 1972.- Vol.2.- P.1226-1227.
5. Hately, Case and Campbell. Establishing the death of an embryo by ultrasound.//Ultrasound Obstet. Gynecol.- 1995.- Vol.5.- P. 353-357.
6. Simona Cicero, Patrizia Curcio, Aris Papageorghiou, Jiri Sonek, Kypros Nicolaides Absence of nasal bone in fetuses with trisomy 21 at 11-14 weeks of gestation: an observational study Lancet.- 2001.-Vol. 358.- P.851-853.
7. Schaefer M, Laurichesse-Delmas H, Ville Y. The effect of nuchal cord on nuchal translucency measurement at 10-14 weeks. // Ultrasound Obstet. Gynecol.- 1998.-Vol.11.-P.271-273.
8. Whitlow BJ, Chatzipapas IK, Economides DL. The effect of fetal neck position on nuchal translucency measurement.// Br. J. Obstet. Gynaecol.- 1998.-Vol.105.-P.872-876. 9. Whitlow BJ, Economides DL. The optimal gestational age to examine fetal anatomy and measure nuchal translucency in the first trimester. //Ultrasound Obstet. Gynecol.- 1998.-Vol.11.-P.258-261.