Ultrasound screening during pregnancy
Antepartum fetal testing

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Ultrasound examinations in Hungary are performed under the recommendations of the Hungarian Society of Ultrasound in Obstetrics and Gynecology (Magyar Szülészeti és Nőgyógyászati Ultrahang Társaság - MSZNUT)
MSZNUT

Established in 1992

Organizes four postgraduate courses every year, with an average of 100 participants, and holds the Society’s National Congress every 2 years for almost 1000 registered participants.
INSTITUTIONAL CONDITIONS, BOARD LEVELS

I. Basic level
II. Intermediate level
III. Upper level (special supply)
I. BASIC LEVEL

Screening or diagnostic ultrasound examination performed in private practice, office, city hospital.

In suspect or pathological cases, superior level consultation is required.

Examinations are performed by specialists with “A”, “B” and “C” proficiency certificates or sonographers.
II. INTERMEDIATE LEVEL

“High risk” population screening or examination of the previously screened pathological cases.

- **Place of examination:** county or capital hospital (regional center).

- **Expectation:** diagnosis or differential diagnosis of the abnormal cases, Doppler examination. If special examination (fetal echocardiography, genetic counseling, biochemistry) is needed, higher level consultation is required.

- Examinations are performed by specialists with “B” and “C” proficiency certificates.
III. UPPER LEVEL
(SPECIAL SUPPLY)

Final estimation of the pathological cases.

Place of examination: prenatal diagnostic center accredited for ultrasound-guided invasive procedures, or institution appointed by MSZNUT.

Examinations are performed by specialists with “C” proficiency certificates.
TECHNICAL BACKGROUND AND EXPECTATION

I. BASIC LEVEL

Fine resolution scanning, 2D real-time imagery with 3.5-5.0 MHz convex, linear, transabdominal phased- or vector-array transducer and preferably 5-6.5-7.5-9 MHz convex, sector, phased-array transvaginal transducer.

The machine can measure distance and circumference.

Photo documentation
II. and III. LEVEL

High resolution scanning, 2D or 3/4D imagery, Doppler technique, 3.5-5.0 MHz convex, linear, transabdominal phased- or vector-array transducer and preferably 5-6.5-7.5-9 MHz convex, sector, phased-array transvaginal transducer.

Photo documentation.
ULTRASOUND EXAMINATION DURING PREGNANCY

Obstetrical transvaginal sonography (TVS)
WHO code: 36141

Obstetrical transabdominal sonography (TAS)
WHO code: 36140
OBSTETRICAL TRANSVAGINAL SONOGRAPHY (TVS)

Aim: TVS is suggested during the first trimester of pregnancy (till 12-13. gestational weeks).

If there are no possibilities for TVS, the examination can be performed transabdominally, but the changes during the early pregnancy can be recognized a week later.
STRUCTURES WHICH CAN BE EXAMINED

- Gestational sac (format, number, dimension, localization)
- Chorion frondosum
- Yolk sac
- Embryo/fetus: number, size – CRL, cardiac activity
- Sonoanatomy, malformations (nuchal translucency, cystic hygroma, hydrops)
- Pathological early gestation (subchorionic hematoma, mola hydatidosa, lost plural conception)
- Uterus, adnexa (localization, size, structure, malformations)
- Douglas cavity
- Probable or assured sign of ectopic pregnancy
- Pelvic pathology, mass (size, structure, localization, surface)
OBSTETRICAL TRANSABDOMINAL SONOGRAPHY (TAS)

Aim: examination of the pregnancy from the 13th gestational week (transverse and longitudinal section; same organs in special sections).
STRUCTURES WHICH CAN BE EXAMINED

- Vital sign and position of the fetus
- Amniotic fluid volume: (< 2 cm oligohydramnios, > 8 cm hydramnios, or AFI – four quadrant method)
- Placenta: localization, maturity (0-III), structure, occurrent band(s)
- Multiple pregnancy: absence or presence, layers and thickness of the dividing membrane
- Umbilical cord: blood vessels (two arteries, one vein), structure
Skull: intracranial structures (falx cerebri, septum pellucidum, thalamus, ventricle, plexus chorioideus, cysterna magna), face

Spine: arch (longitudinal and transverse), vertebral ossification core

Thorax: configuration, size, lung’s echogenicity, breathing, diaphragm

Heart: rhythm, frequency, four chamber view, outflow tracts

Abdominal cavity, wall, umbilical ring: stomach, liver, bowels, free fluid accumulation, kidneys, bladder

Genitalia

Extremities: bone’s length, structure, absence, curve, deformity

Subcutaneous layer: signs of hydrops or fetopathy
MEASURABLE PARAMETERS

- Biparietal diameter (BPD): between the outer border of proximal and inner border of distal parietal bone; axial image including the thalamus
- Occipitofrontal diameter (OFD): outside-outside diameter
- Head circumference (HC): can be calculated from BPD and OFD, or can be measured using ellipse caliper
- Abdominal diameters (AD): anteroposterior and transverse diameters - outside-outside diameter, at the level of the junction of the umbilical and portal vein
- Abdominal circumference (AC): can be calculated from two AD, or can be measured using ellipse caliper
- Femoral length (FL): the distance of femur diaphysis (without the cores of ossification)
- From the quotient of some parameters (BPD/FL, BPD/AC, HC/AC, FL/AC), the growing process of the fetus can be estimated
The comparison of gestational age estimated from the measured parameters with the gestational age calculated from the first day of the last period or with the growth standards, can help to recognize the abnormalities of fetal growth (macrosomia, IUGR).
RECOMMENDED ULTRASOUND EXAMINATIONS DURING PREGNANCY
ULTRASOUND EXAMINATION DURING EARLY GESTATION
(diagnostic examination – “0” screening)

TVS

Time of examination: the time of the first prenatal visit
Examinable:

- Pregnancy verification (gestational sac, embryo)
- Gestational age (size of GS, CRL)
- Verification of the multiple gestation
- Blighted ovum
- Missed abortion
- Mola hydatidosa
- Subchorial hematoma
- Ectopic pregnancy
- Gynecological abnormalities
I. ULTRASOUND EXAMINATION (screening)

TVS or TAS

**Time of examination:** 11-13. GW

**Aims:**
- congenital malformation and/or fetal chromosomal-aberration markers screening,
- recognize the pathological states and
- to establish the correct gestational age
Examinable:

- Skull, nasal bone
- Spine
- Nuchal translucency
- Heart (four chambers)
- Diaphragm
- Stomach
- Abdominal wall
- Kidneys, bladder
- Extremities
- Placenta, umbilical cord
- Biometry (CRL, BPD, AC, FL)
- Ductus venosus flow
II. ULTRASOUND EXAMINATION (screening)

TAS

Time of examination: 18-20. GW

Aims:
• congenital malformation and/or fetal chromosomal-aberration markers screening,
• recognize the pathological states and pathological placentation
Examinable:
- Skull (BPD, OFD, HC)
- Face
- Spine
- Heart (four chambers, outflow tracts)
- Diaphragm
- Stomach
- Abdomen (AD and AC), abdominal wall, cord insertion
- Kidneys (parenchyma, renal pelvis size), bladder
- Extremities (FL)
- Placenta, umbilical cord, amniotic fluid
- Uterine artery doppler-examination (high-risk population)
III. ULTRASOUND EXAMINATION (screening)

TAS

**Time of examination:** 30-31. GW

**Examinable:**
- “Late-onset” congenital malformations (corpus callosum agenesis)
- Biometry (BPD, OFD, HC, AC, FL) - IUGR
- Amniotic fluid volume
- Placental localization and maturity

**Aim:** to recognize the high-risk population (follow-up and/or Doppler-examination)
IV. ULTRASOUND EXAMINATION (screening)

TAS

Time of examination: 36-37. GW

Examinable:
- fetal presentation
- biometry (BPD, OFD, HC, AC, FL) (fetal weight: ± 10%)
- amniotic fluid volume
- placental localization and maturity
- umbilical cord position
- previous C.S. scar examination (full bladder)

Aim: to recognize the high-risk population (mode of delivery)
FETAL ECHOCARDIOGRAPHY (WHO code: 3612G)

**INDICATIONS**

- positive history (maternal, previous child, family)
- predisposing maternal diseases, states:
  - diabetes
  - isoimmunization
  - phenylketonuria
  - maternal age > 37 years
- teratogenic or drug effects: phenytoin, lithium, isotretinoin, OC, rubella, antihypertensive drugs
- screened anomalies during pregnancy:
  - proved or supposed fetal malformation
  - pathological fetal heart configuration
  - abnormal amniotic fluid volume
  - pathological fetal growth
  - multiple pregnancy
  - fetal arrhythmia
Ultrasound examinations in Hungary are performed under the recommendations of the Hungarian Society of Ultrasound in Obstetrics and Gynecology (MSZNUT) and there are five recommended ultrasound examinations during the pregnancy (one diagnostic and four screenings).

There are well-defined levels and protocols of attendance.

The different levels of attendance require proficiency at different levels and this necessitates regular training, which is ensured by MSZNUT.
Antepartum fetal testing

Aim: to evaluate fetal well-being (prevent fetal death)
In the majority of high-risk pregnancies, testing begins by 32-34 weeks

- Counting fetal movements (at least 10/hour)
- Non-stress test (NST)
- Contraction stress test
- Amnioscopy
- Doppler velocimetry
- Biophysical profile
Non-stress test

A: Fetal heartbeat; B: Indicator showing movements felt by mother (caused by pressing a button); C: Fetal movement; D: Uterine contractions

**Reactive NST:** two or more accelerations of 15 beats/min or more, each lasting at least 15 seconds within 20 minutes
Contraction stress test

Aim: to evaluate uteroplacental function

- Oxytocin challenge test (iv. oxytocin infusion 0.5 mU/min, doubled every 20 minutes)
- Nipple stimulation test (rubbing one nipple for 2 minutes, restart after 5 minutes)
Amnioscopy
DOPPLER SONOGRAPHY
(PLACENTAL AND FETAL)
WHO code: 3616E, 3617E

INVESTIGATED VESSELS

- Uterine artery (UtA)
- Umbilical artery (UA)
- Fetal descending aorta (FDA)
- Middle cerebral artery (MCA)
## Biophysical profile

<table>
<thead>
<tr>
<th>Component</th>
<th>Score 2</th>
<th>Score 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonstress test(^a)</td>
<td>(\geq 2) accelerations of (\geq 15) beats/min for (\geq 15) sec in 20–40 min</td>
<td>0 or 1 acceleration in 20–40 min</td>
</tr>
<tr>
<td>Fetal breathing</td>
<td>(\geq 1) episode of rhythmic breathing lasting (\geq 30) sec within 30 min</td>
<td>(&lt;30) sec of breathing in 30 min</td>
</tr>
<tr>
<td>Fetal movement</td>
<td>(\geq 3) discrete body or limb movements within 30 min</td>
<td>(\leq 2) movements in 30 min</td>
</tr>
<tr>
<td>Fetal tone</td>
<td>(\geq 1) episodes of extension of a fetal extremity with return to flexion, or opening or closing of hand</td>
<td>No movements or no extension/flexion</td>
</tr>
<tr>
<td>Amnionic fluid volume(^b)</td>
<td>Single vertical pocket (&gt;2) cm</td>
<td>Largest single vertical pocket (\leq 2) cm</td>
</tr>
</tbody>
</table>
Thank you for attention!