Complete Summary

GUIDELINE TITLE

Ultrasound scanning during pregnancy.

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Ultrasound scanning during pregnancy. In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2004 Jun 28 [Various].

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Ultrasound scanning during pregnancy. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Apr 19. Various p.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
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SCOPE

DISEASE/CONDITION(S)

Pregnancy

GUIDELINE CATEGORY

Diagnosis
Evaluation
Prevention

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Obstetrics and Gynecology

INTENDED USERS

Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

Evidence-Based Medicine Guidelines collects, summarizes, and updates the core clinical knowledge essential in general practice. The guidelines also describe the scientific evidence underlying the given recommendations.

TARGET POPULATION

Pregnant women

INTERVENTIONS AND PRACTICES CONSIDERED

Ultrasound during routine and high-risk pregnancies

MAJOR OUTCOMES CONSIDERED

- Number of perinatal deaths
- Admissions to hospital
- Incidence of post-term pregnancy
- Need for induction of labor

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence reviewed was collected from the Cochrane database of systematic reviews and the Database of Abstracts of Reviews of Effectiveness (DARE). In addition, the Cochrane Library and medical journals were searched specifically for original publications.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

A. Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
B. Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
C. Limited research-based evidence. At least one adequate scientific study.
D. No research-based evidence. Expert panel evaluation of other information.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of evidence [A-D] supporting the recommendations are defined at the end of the "Major Recommendations" field.

Basic Rules

- Training under a specialist is essential (exceptions: foetal pulse on weeks 7 to 9 of pregnancy and presentation in late pregnancy).
- Do not hesitate to consult a specialist.

Aims

- Expected date of confinement (EDC) (the most important and easy to carry out)
- Number of foetuses
- Position of the placenta
- Foetal structures, morphology
- Presentation, when needed (easy to carry out)
- Growth if deviation is suspected
- The time of the first routine scan is agreed upon locally and depends on the mode of trisomy screening.

Recognizing Pregnancy

Amniotic Sac

- An intrauterine amniotic sac can be identified as early as on the 5th week of pregnancy (WOP) with a transvaginal scan (TVS). The sac is visualized as a round clear area in the uterine cavity.
- With a transabdominal scan (TAS) the amniotic sac can be seen much later, usually between the 7th and 9th WOP, depending on the thickness of mother's abdominal wall and the position of the uterus.
- In practice, visualization of an intrauterine amniotic sac rules out the possibility of an extrauterine pregnancy (de Crespigny, Cooper, & McKenna, 1988; Timor-Tritsch, Farine, & Rosen, 1988; Bernaschek, Rudelstorfer, & Csaicsich, 1988).

The Embryo

- First seen as a small dense echo within the amniotic sac
- The foetal heart beat can be detected as a barely visible flutter already when the foetus is only a few millimeters long.
- The yolk sac is seen as a separate ring-like structure in the amniotic sac (Timor-Tritsch, Farine, & Rosen, 1988; Bernaschek, Rudelstorfer, & Csaicsich, 1988).

Multifoetal Pregnancies

- A twin pregnancy can be determined in early pregnancy. One embryo can, however, be aborted, which manifests as bleeding in early pregnancy.
- It is possible to predict the chorionicity of a twin pregnancy in several ways: the placental tissue penetrating between the layers of the placental insertion

of the separating membrane ("twin peak" or lambda sign) indicates dichorionicity. If the thickness of the separating membrane is less than 2 mm, monochorionicity is likely. It may sometimes be possible to count the number of layers of the separating membrane (two in mono- and four in dichorionic twins) (Fisk & Bryan, 1993; Barss, Benecerraf, & Frigoletto, 1985: Kurtz et al., 1992).

Corpus Luteum Cyst

On WOP 7 to 11, a separate unilocular clear, thin, walled cyst measuring 2 to 4 cm is often seen beside the uterus. This vanishes later on and needs no intervention.

Estimation of Gestational Age

- Ultrasound scan before 20 WOP is the most reliable method for determining EDC.
- Accuracy is best on 10 to 12 WOP $\pm$3 to 4 days, at other times $\pm$7 days. If the time determined by ultrasound differs from that determined from menstruation by more than one week, EDC should be corrected.
- The crown-rump-length (CRL) is used to estimate gestational age before 13 WOP (Daya, 1993).
- After 11 WOP biparietal diameter (BPD) or the length of the diaphysis of the femur (femur length) or both are used.
- The gestational age corresponding to the obtained measures is given in tables that are programmed in to many ultrasound devices. Such devices give both the gestational age and EDC automatically.

Foetal Structures (Morphology)

- The most appropriate time for routine scanning of foetal structures is the 16 to 20 WOP
- The structures are examined systematically.

1. The head and spinal canal
    - In the transverse plane the foetal skull is seen as an ellipsoid structure with a symmetric mid-echo. BPD is measured in this plane. If a good BPD cannot be achieved, anencephaly should be suspected.
    - Normally, symmetrical dense echoes, choroid plexuses, are seen on both sides of the mid-echo. If the echoes are asymmetrical or nonhomogeneous and the duration of gestation counted from menstruation and femur length differs clearly from that estimated from BPD, further investigations are warranted.
    - In the sagittal plane the profile of the foetal face, skull, and nuchal area can be seen and encephalocoele can be ruled out.
    - The spinal canal forms a zip-like structure and should be inspected for possible meningocoele. Additionally, a lemon-shaped skull indicates a neural tube defect (Romero et al., 1988).
    - The neck region is examined for possible cysts and nuchal oedema. Every fourth foetus with abnormal nuchal translucency seen (on weeks 11–13) in subcutaneous tissue has a chromosomal deviation (most commonly trisomy, with 21 trisomy causing Down's syndrome being

the most frequent finding) (Taipale et al., 1997). Nuchal translucency screening allows detection of up to 60 to 80% of foetuses with Down's syndrome. See the Finnish Medical Society Duodecim guideline "Down's Syndrome."

- The scan is most reliable when the fetal CRL is between 45 and 85 mm (gestational age 11–13 weeks). An analogue 95th percentile scale is used for an abnormal nuchal translucency (NT): the cut-off point for a 45-mm CRL fetus being 2.0 mm, for a 60-mm CRL fetus 2.5 mm, and for a 85-mm CRL fetus 3.0 mm. A single cut-off point 2.5 mm is also widely used. The higher the NT, the greater is the risk for an abnormal karyotype.
- NT is measured from the inner edge of the skin to the outer edge of the underlying tissue (i.e., the shortest distance as possible). The best possible side profile and image magnification should be used.
- Strongly deflected foetal head can give a false positive finding. A loose amniotic membrane at the dorsal side of the foetus can also be a source for misinterpretation.
- Foetal nasal bone is possible to see during the same scan. If this can be seen, the risk for a trisomy 21 is very low.

2. The outline of the foetal body
    - Any abnormality on the dorsal side is usually seen upon inspection of the spinal canal.
    - In the ventral outline, attention should be paid to the insertion of the umbilical cord for possible omphalocele or gastrochisis in the abdominal wall.
    - A greater magnification is used to look for sacral teratoma.
    - Foetal body movement should be noted (Romero et al., 1988)
3. The thorax and heart
    - In the transverse plane of the thorax, the normal heart gives a four-chambered view. The synchronized function of the atria, ventricles, and valves should be noted. The heart is located near the midline and takes up about one third of the total area of the thoracic cavity.
    - Small echo-dense spots (golf balls) in the area of the papillary muscles suggest a slightly increased risk of trisomy.
    - The pulmonary tissue is homogenous in echodensity.
    - The points of departure of the great vessels are difficult to distinguish before 20 WOP.
4. The abdominal cavity
    - The ventricle forms an echo-free, bean-shaped structure beneath the diaphragm, and this finding also indicates a patent oesophagus.
    - Liver and kidneys are not easy to identify before 20 WOP. A fluid-filled bladder at the caudal end of the cavity indicates normal function of at least one kidney and ureter. If the bladder cannot be visualized but the amount of amniotic fluid is normal, control the finding.
    - Fluid accumulation in the abdomen, other than the ventricle and bladder, indicate further investigation (Romero et al., 1988).
    - Echo-dense intestines and/or mild pyelectasia suggest increased risk of trisomy.
5. The extremities
    - In addition to biparietal length, the length of the femur is an important measure when determining gestational age on weeks 15 to 19 of pregnancy. A considerable discrepancy between these measures warrants further investigations.

    - The outline of the limbs, hands and feet, and the position of the wrists and ankles should be noted (Romero et al., 1988).
    - Foetal body movement should be noted.
6. The placenta, umbilical cord, and amniotic fluid
    - A low-lying placenta is a common finding in early and mid-pregnancy. The position of the placenta needs to be determined on weeks 25 to 27. However, as the isthmic portion of the uterus usually grows more than the other parts, the placenta seems to "migrate" upwards.
    - The identification of the lower edge of the placenta is easier with full maternal bladder (Zelop et al., 1994).
    - A back-wall placenta is seen better with transvaginal ultrasound.
    - In early pregnancy the amniotic fluid is formed by the amniotic membranes, and the foetus can move freely in ample fluid.
    - In mid- and late pregnancy the fluid results from foetal metabolism, predominantly urine. Severe oligohydramnios in mid-pregnancy, irrespective of the aetiology, is associated with poor prognosis due to the fact that a sufficient amount of amniotic fluid is essential for foetal pulmonary maturation.
    - The amount of amniotic fluid is considered to be normal when the diameter of the deepest pocket measures 3 to 8 cm. Amniotic fluid index (AFI) is considered a more extensive measure of the amount of amniotic fluid. In this investigation, the gestational sac is divided into four equal-sized blocks, and the deepest pocket in each block is measured. Amniotic fluid index is the sum of these measures. On the second and third trimesters, amniotic fluid index between 8 and 24 is regarded normal (Chamberlain et al., 1984).
    - An abnormal amount of amniotic fluid is an indication for further investigations.
    - In a cross-section of a normal umbilical cord, three vessels can be seen. A single umbilical artery can be associated with other vascular (or urinary) anomalies and warrants careful examination of foetal structures (Lilja, unpublished).
7. The cervix
    - In early and midpregnancy, the cervix is quite easy to see if the maternal bladder is full. If the length of the cervical canal is less than 30 mm or the proximal part is dilated, cervical incompetence should be suspected (Iams et al., 1996).
8. Gender
    - There are very few clinical indications for identifying foetal sex.
    - Labia suggest a female foetus and echo-dense testes that have descended to the scrotum and penis suggest a male. Umbilical cord between the legs easily causes false interpretations of gender.

Ultrasound Markers for Trisomy in Mid-pregnancy

- As a single finding, the following markers (listed below) increase the risk for trisomy only slightly. However, if two or more markers are present in one foetus, foetal karyotyping should be considered (Snijders, Shawa, & Nicolaides, 1994).
    - Plexus choroideus cysts
    - Flat profile

- Echodense dots in the papillary muscles of the foetal heart ("golf-balls")
- Echodense intestine
- Mild hydronephrosis
- Growth retardation
- Short femur
- Umbilical cord cysts

Foetal Growth

- On the latter half of pregnancy, the growth and development are followed up in addition to foetal structures.
- Routine ultrasound screening in late pregnancy is not necessary in low-risk pregnancies or without a clear target (Bricker & Neilson, 2004) [**B**].
- Rapidly growing BPD may suggest hydrocephalus and slowly growing microcephaly or some other central nervous system (CNS) disease.
- Retarded growth of the foetal abdominal circumference with normally growing BPD is often a sign of impaired function of the placenta. Excessive growth of the body may suggest foetal hydrops.
- Retarded growth of the limbs warrants further investigations.

Estimation of Weight

- Measurement of abdominal circumference is the most important parameter for weight estimation. This should be measured as symmetrically as possible from the plane of the foetal liver, sinum umbilicalis, and ventricle. Several measurements should be made, and the average should be used in the final estimation (Hadlock et al., 1984).
- Many programs give an estimate automatically on the basis of abdominal circumference and BPD.
- In the beginning of the third trimester, BPD correlates well with foetal weight; however, towards the end, and especially if foetal gigantism is suspected, femur length is a more accurate measure.
- In a large-sized foetus, small BPD and great abdominal circumference indicate an increased risk of getting stuck at the shoulders at birth.
- Before week 30, a weight estimate has little significance.

Presentation

After the 35th WOP anything other than a cephalic presentation is an indication for an obstetric consultation.

Post-term Pregnancy

Decreasing amniotic fluid volume is considered to correlate better with deteriorating placental function than structural changes (calcification and lobularity) in the placenta (Crowley, O'Herlihy, & Boylan, 1984)

Doppler Ultrasound of the Umbilical Artery

There is some evidence that Doppler ultrasound of the umbilical artery may reduce perinatal deaths in risk pregnancies (Goffinet et al., 1997; DARE-973300, 2000) [**B**].

Related Evidence

- Doppler ultrasound assessment in high risk pregnancies improves a number of obstetrics outcomes and may help to reduce perinatal deaths (Neilson & Alfirevic, 2004) [**A**].
- Routine early pregnancy ultrasound enables the determination of delivery date and helps to reduce the incidence of post-term pregnancies (Crowley, 2004) [**B**].
- Routine induction of labour after 41 weeks gestation probably reduces perinatal deaths (Crowley, 2004) [**B**].

Definitions:

Levels of Evidence

A. Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
B. Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
C. Limited research-based evidence. At least one adequate scientific study.
D. No research-based evidence. Expert panel evaluation of other information.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Concise summaries of scientific evidence attached to the individual guidelines are the unique feature of the Evidence-Based Medicine Guidelines. The evidence summaries allow the clinician to judge how well-founded the treatment recommendations are. The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- The use of Doppler ultrasound in high risk pregnancies appears to improve a number of obstetric outcomes and appears promising in helping to reduce perinatal deaths.
- Routine early pregnancy ultrasound examination and subsequent adjustment of delivery date appear to reduce the incidence of post-term pregnancy. Routine induction of labour after 41 weeks gestation appears to reduce perinatal mortality.
- The use of umbilical Doppler in a high-risk population reduces perinatal mortality by around one third.

Subgroups of Patients Within Target Population Most Likely to Benefit from These Recommendations

Women in high-risk pregnancies and women with post-term pregnancies

POTENTIAL HARMS

Not stated

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Ultrasound scanning during pregnancy. In: EBM Guidelines. Evidence-Based Medicine [Internet]. Helsinki, Finland: Wiley Interscience. John Wiley & Sons; 2004 Jun 28 [Various].

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Apr 3 (revised 2004 Jun 28)

GUIDELINE DEVELOPER(S)

Finnish Medical Society Duodecim - Professional Association

SOURCE(S) OF FUNDING

Finnish Medical Society Duodecim

GUIDELINE COMMITTEE

Editorial Team of EBM Guidelines

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary Author: Ari Ylä-Outinen

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Ultrasound scanning during pregnancy. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2004 Apr 19. Various p.

GUIDELINE AVAILABILITY

This guideline is included in "EBM Guidelines. Evidence-Based Medicine" available from Duodecim Medical Publications, Ltd, PO Box 713, 00101 Helsinki, Finland; e-mail: info@ebm-guidelines.com; Web site: www.ebm-guidelines.com.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on August 28, 2001. The information was verified by the guideline developer as of October 26, 2001. This summary was updated on December 29, 2003, October 5, 2004, and February 18, 2005.

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