

THE USE OF FIRST TRIMESTER ULTRASOUND

This guideline has been reviewed by the Diagnostic Imaging Committee and approved by the Executive and Council of the Society of Obstetricians and Gynaecologists of Canada.

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Abstract

Objective: To review the clinical indications for first trimester ultrasound.

Outcome: Proven clinical benefit from first trimester ultrasound.

Evidence: MEDLINE search and bibliography reviews in relevant literature.

Values: Content and recommendations reviewed by the principal authors and the Diagnostic Imaging Committee of the Society of Obstetricians and Gynaecologists of Canada. Levels of evidence were judged as outlined by the Canadian Task Force on the Periodic Health Examination.

Recommendations:

1. First trimester ultrasound is recommended for assessment of threatened abortion to document fetal viability (II-2B) or for incomplete abortion to identify retained products of conception (II-2B).
2. First trimester ultrasound is not recommended to diagnose pregnancy, to date pregnancy when last normal menstrual period and physical examination are concordant, or to investigate an inevitable abortion (II-2B). First trimester ultrasound is indicated when last menstrual period date is uncertain (I-A).
3. First trimester ultrasound is recommended prior to pregnancy termination. (II-2B)
4. First trimester ultrasound is recommended during diagnostic or therapeutic procedures requiring visual guidance (e.g., chorionic villus sampling, amniocentesis) and prior to cervical cerclage placement. (I-A)

Key Words

Ultrasonography, prenatal; prenatal diagnosis; genetic screening; diagnostic tests, routine; pregnancy, first trimester

5. First trimester ultrasound is recommended for suspected multiple gestation to allow for reliable determination of chorionicity or amnionicity. (II-2A)
6. First trimester ultrasound is recommended for suspected ectopic pregnancy, molar pregnancy, and suspected pelvic masses. (II-1A)
7. First trimester ultrasound is recommended for early assessment of anatomic development in situations of increased risk for major fetal congenital malformations. (II-3C)
8. Nuchal translucency screening should only be offered as part of a comprehensive prenatal screening and counselling program by experienced operators with appropriate quality assurance processes in place. (II-2A)

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INTRODUCTION

Ongoing technological advancement, as well as the use of high-frequency transvaginal scanning, has allowed the resolution of ultrasound imaging in the first trimester to evolve to the stage where more detailed early fetal development can be visualized. In many circumstances, it remains unknown how this new information should affect management options. This guideline provides a review of the clinical indications for first trimester ultrasound and how the information from ultrasound can influence therapy. For the purposes of this document, first trimester includes all examinations before 14 weeks, although for certain

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indications, the gestational timing requires more specific limits.

The level of evidence reported in these guidelines has been determined using the criteria described by the Canadian Task Force on the Periodic Health Examination (Table).¹

PREGNANCY DIAGNOSIS

Ultrasound is neither a clinically effective nor cost-effective method to diagnose pregnancy.²

UNCERTAIN DATES

Accurate dating has been the strongest argument for routine early ultrasound.³ Crown–rump length at 8 to 12 weeks is the most accurate method to date pregnancy; it will predict the expected date of birth to within 5 days (2 standard deviations).⁴ Accurate dating decreases the number of labour inductions for post-term pregnancy and is important to determine the timing of planned Caesarean sections to prevent iatrogenic prematurity.^{5,6} Accurate dating is also important to assess fetal growth and interpret maternal serum screening.⁷

For women who have regular menstrual cycles and who have not used oral contraceptives just prior to pregnancy, ultrasound dating may be less important.⁸ In these circumstances, ultrasound at 18 to 20 weeks will allow for gestational age confirmation.

THREATENED ABORTION

Bleeding in early pregnancy can cause anxiety for the woman and her partner, and uncertainty for their physician. In such circum-

stances, ultrasound demonstration of fetal life is reassuring and helps to guide management.⁹⁻¹² Ultrasound is not indicated if abortion is inevitable, as defined by the finding of a dilated cervix. With a suspected incomplete abortion, however, ultrasound can identify retained products of conception.¹³ Ultrasound is not necessary if fetal heart tones are heard.

RECOMMENDATIONS

- 1. First trimester ultrasound is recommended for assessment of threatened abortion to document fetal viability (II-2B) or for incomplete abortion to identify retained products of conception (II-2B).**
- 2. First trimester ultrasound is not recommended to diagnose pregnancy, to date pregnancy when last normal menstrual period and physical examination are concordant, or to investigate an inevitable abortion (II-2B). First trimester ultrasound is indicated when last menstrual period date is uncertain (I-A).**

FIRST TRIMESTER INDUCED ABORTION

First trimester induced abortion is associated with lower maternal morbidity than second trimester termination procedures.^{14,15} An inaccurate estimation of gestational age can be avoided by ultrasound examination prior to procedure selection.¹⁶

RECOMMENDATION

- 3. First trimester ultrasound is recommended prior to pregnancy termination. (II-2B)**

QUALITY OF EVIDENCE ASSESSMENT¹	CLASSIFICATION OF RECOMMENDATIONS¹
<p>The quality of evidence reported in these guidelines has been described using the Evaluation of Evidence criteria outlined in the Report of the Canadian Task Force on the Periodic Health Examination.</p> <p>I: Evidence obtained from at least one properly randomized controlled trial.</p> <p>II-1: Evidence from well-designed controlled trials without randomization.</p> <p>II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group.</p> <p>II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category.</p> <p>III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.</p>	<p>Recommendations included in these guidelines have been adapted from the ranking method described in the Classification of Recommendations found in the Canadian Task Force on the Periodic Health Examination.</p> <p>A. There is good evidence to support the recommendation that the condition be specifically considered in a periodic health examination.</p> <p>B. There is fair evidence to support the recommendation that the condition be specifically considered in a periodic health examination.</p> <p>C. There is poor evidence regarding the inclusion or exclusion of the condition in a periodic health examination, but recommendations may be made on other grounds.</p> <p>D. There is fair evidence to support the recommendation that the condition not be considered in a periodic health examination.</p> <p>E. There is good evidence to support the recommendation that the condition be excluded from consideration in a periodic health examination.</p>

INVASIVE DIAGNOSTIC OR THERAPEUTIC PROCEDURES

Chorionic villus sampling (CVS) and amniocentesis should be done with continuous ultrasound guidance.^{17,18} Following confirmation of fetal life, the success of transabdominal or transcervical CVS depends upon reliable placental localization.^{19,20} Although ultrasound guidance is required for early amniocentesis, this procedure is rarely done because of increased fetal risk.²¹ Selective reduction in multifetal pregnancies can be done transabdominally or transvaginally and both approaches require continuous ultrasound guidance.²²

CERVICAL CERCLAGE

A National Institutes of Health Consensus Development conference on Diagnostic Imaging in Pregnancy concluded that ultrasound aids in the timing and placement of a cervical cerclage.²³ This is particularly relevant given a cervical abnormality secondary to intrauterine diethylstilbestrol exposure, cone biopsy, or cervical trauma.²⁴ It is also important to confirm fetal life and normal early development prior to such a procedure.

RECOMMENDATION

4. First trimester ultrasound is recommended during diagnostic or therapeutic procedures requiring visual guidance (e.g., chorionic villus sampling, amniocentesis) and prior to cervical cerclage placement. (I-A)

MULTIPLE GESTATION

First trimester ultrasound to identify multiple gestation should be considered with:

- assisted reproduction technologies
- a uterine size greater than suggested by the last normal menstrual period
- hyperemesis gravidarum
- a family history of multiple gestation

In multiple gestation, the ultrasound examination should include number of fetuses, confirmation of life, crown–rump lengths and/or bioparietal diameters, chorionicity or amnionicity, and if expertise is available, nuchal translucency assessment. The maternal age criterion for offering prenatal genetic testing with a twin pregnancy is 32 years at the expected date of birth.²⁵ In this circumstance, maternal serum screening for aneuploidy is not effective and a nuchal translucency assessment of risk for each fetus should be applied if such expertise is available. Nuchal translucency measurements are also relevant as a predictor of twin-to-twin transfusion syndrome.²⁶

Ultrasound can define chorionicity or amnionicity most reliably in the first trimester.²⁷ Accurate diagnosis of a monoamniotic twin pregnancy is important because of the risk

of perinatal loss from cord entanglement. In this circumstance, fetal surveillance and elective preterm delivery are indicated.²⁵ The accurate diagnosis of a monochorionic, diamniotic twin pregnancy is important because it selects a subgroup of twin pregnancies at higher risk for twin-to-twin transfusion syndrome, congenital anomalies, intrauterine growth restriction, and perinatal mortality.^{17,28} Specific fetal surveillance is indicated in these circumstances.

RECOMMENDATION

5. First trimester ultrasound is recommended for suspected multiple gestation to allow for reliable determination of chorionicity or amnionicity. (II-2A)

ECTOPIC PREGNANCY

The value of ultrasound in ectopic pregnancy diagnosis has been demonstrated.^{29,30} Ectopic pregnancy incidence has risen, and although only approximately 1% of gestations are extrauterine, these account for 4% of direct maternal deaths.³¹ The combination of specific ultrasound findings with serum β -human chorionic gonadotropin measurements can detect as many as 96% of ectopic pregnancies with a specificity of 100%. These same studies show a positive predictive value of 100% and a negative predictive value of 92% in women with a clinical suspicion of an ectopic pregnancy.³²⁻³⁴ Given established risk factors or clinical suspicion, early ultrasound is recommended.

MOLAR PREGNANCY

Ultrasonography is a sensitive and reliable method for diagnosing molar pregnancy.³⁵⁻³⁷ When there is a suspicion of a hydatidiform mole based on symptoms or signs, ultrasound permits accurate diagnosis of this neoplasm. Early diagnosis of a hydatidiform mole is desirable to decrease the risk of significant complications, particularly those related to respiratory function.³⁸ Following treatment of molar pregnancy, ultrasound can be used to monitor ovarian cyst resolution and uterine involution.³⁶

PELVIC MASS

If a first trimester pelvic mass is discovered, ultrasound can identify its location and characteristics.³⁹ Pattern recognition and subjective evaluation of the ultrasound image can suggest whether the lesion is benign or malignant.⁴⁰ Doppler assessment provides minimal contribution to the diagnosis.⁴¹

RECOMMENDATION

6. First trimester ultrasound is recommended for suspected ectopic pregnancy, molar pregnancy, and suspected pelvic masses. (II-1A)

EARLY FETAL ANATOMIC REVIEW

First trimester ultrasound review of fetal anatomy is hampered by fetal size and requires suitable ultrasound equipment and an ability to complement the exam with transvaginal scanning. Unlike imaging at 18 to 20 weeks, when fetal anatomy correlates more closely to postnatal findings, assessment of fetal anatomy in the first trimester requires an expert understanding of embryologic development. For this reason, the assessment has focused on targeted examinations for high-risk couples being seen in tertiary-care facilities. It is important to be aware of variations in anatomic appearance at different gestational ages to avoid false-positive diagnoses of anomalies. For example, the fetal brain at 11 weeks looks distinctly different with the choroid plexus filling the lateral ventricles. Hydrocephalus cannot be easily diagnosed in this circumstance. Similarly, the physiological midgut herniation should not be mistaken for an omphalocele, as this cannot be considered abnormal until the fetus is beyond 12 weeks' gestation.⁴²

In an unselected, low-risk population, first-trimester sonography detected 63% of structural abnormalities⁴³; however, there have been no prospective studies to assess the impact of this early anatomic screening on prenatal diagnosis with ultrasound at 18 to 20 weeks.

Although routine screening for fetal development at 11 to 14 weeks is not recommended, women at increased risk of fetal structural and genetic abnormalities should be offered such screening, performed by experienced sonologists.

RECOMMENDATION

7. First trimester ultrasound is recommended for early assessment of anatomic development in situations of increased risk for major fetal congenital malformations. (II-3C)

FETAL GENETIC

(NUCHAL TRANSLUCENCY) SCREENING

Ultrasound at 10 to 13 6/7 weeks (the so-called 11–14 week scan) or with crown–rump length from 45 mm to 84 mm, can quantify the risk of Down syndrome and other genetic abnormalities using nuchal translucency (NT) measurement. The term describes a sonolucent area in the posterior fetal neck. Increased NT is associated with trisomy 21,^{44–50} 18,^{50–52} and 13,^{50–54} certain other chromosomal^{50,55,56} or developmental abnormalities, and numerous genetic syndromes.⁵⁷ In particular, for chromosomally normal fetuses with increased nuchal translucency, there is a higher risk of congenital heart disease, and a properly timed and careful review of fetal heart anatomy is recommended.⁵⁸

Large differences have been reported in aneuploidy detection using nuchal translucency,^{44,59} and in the ability to achieve

appropriate and consistent measurements.^{60–63} The best results are obtained by centres where sonographers and sonologists have been trained specifically for NT screening, and where strict guidelines with quality assurance processes are used.⁵⁰ Nuchal translucency screening should only be offered as part of a comprehensive prenatal screening and counselling program. Combining nuchal translucency with maternal serum biochemistry significantly improves the detection rate, and thus is encouraged as a program of either concurrent or sequential screening.^{51,64}

The use of nasal hypoplasia as an additional early ultrasound marker for fetal Down syndrome is promising, but use of this marker should be considered investigational and only undertaken as part of a research protocol.⁶⁵

RECOMMENDATION

8. Nuchal translucency screening should only be offered as part of a comprehensive prenatal screening and counselling program by experienced operators with appropriate quality assurance processes in place. (II-2A)

CONCLUSION

As comprehensive prenatal screening programs develop, 11-to-14-week ultrasounds may be offered on a “routine basis.” First trimester ultrasound should otherwise be offered only for the specific clinical indications in this document.

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