



Society of Fetal Medicine Practice Guidelines for the Second Trimester Anomalies Scan

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Abstract Ultrasound is now an established tool in the clinical management of pregnancy. Consequent to its major role in clinical decision-making and its remarkable operator dependence, it is necessary to have guidelines for minimum standards of performance of this modality in each area of obstetric ultrasound. The Society of Fetal Medicine guidelines have been developed for use by all the practitioners performing antenatal ultrasound scans. They are intended to provide the entire medical community with standards for the performance of quality ultrasound examinations. Practitioners are encouraged to go beyond these standards in relevant clinical situations. Each guideline in this document has undergone extensive discussion

followed by a consensus. In a rapidly evolving technological and research environment, it is imperative to constantly re-evaluate and update these guidelines. Practitioners are advised to be aware of these updates and incorporate these into their daily practice.

Keywords Anomalies scan · Mid-trimester scan · Guidelines · Fetal anatomical survey

Introduction and Overview

Ultrasound is now an established tool in the clinical management of pregnancy. Consequent to its major role in clinical decision-making and its remarkable operator

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dependence, it is necessary to have guidelines for minimum standards of performance of this modality in each area of obstetric ultrasound. The Society of Fetal Medicine (SFM) guidelines have been developed for use by all practitioners performing antenatal ultrasound scans. They are intended to provide the entire medical community with standards for the performance of quality ultrasound examinations. Practitioners are encouraged to go beyond these standards in relevant clinical situations.

The experience of practitioners from the specialties of obstetrics, radiology and fetal medicine has been drawn upon to prepare these guidelines. Relevant perspectives have been obtained from the guidelines published by the American Institute of Ultrasound in Medicine [1], the American College of Radiology [2], the American College of Obstetricians and Gynecologists [2], the Royal College of Obstetricians and Gynaecologists [3] and the International Society of Ultrasound in Obstetrics and Gynecology [4].

This section of the SFM guidelines pertains to the scan of fetal anomalies in second trimester and includes statements on accuracy and limitations of the scan, fetal safety, patient information requirements, personnel specifications, equipment, documentation and reporting, the timing of the scan with reference to gestational age, and, a protocol for conducting the actual study.

Scope and Limitations of the Anomalies Scan

The second trimester anomalies scan assesses fetal number, life, size, anatomy and environment. At the outset, it must be emphasized that although many malformations can be identified during the systematic evaluation of the fetus during the second trimester anomalies survey, it is well-established that some anomalies may be missed even with the best ultrasound equipment in the hands of highly experienced and well-trained professionals [4]. It is important that all healthcare givers and the patient be aware of this. It is recommended, from a legal viewpoint, that a healthcare practitioner should counsel the pregnant patient/couple/family regarding the potential benefits and limitations of a second trimester fetal ultrasound scan and that a disclaimer be signed prior to the study. It is also important to be aware that several anomalies may develop later in pregnancy.

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Which Patients Should be Offered an Anomalies Scan

Every pregnant woman should be offered a second trimester anomalies scan and made aware of the relevant reproductive rights. Although this may not be feasible in restricted resource and poorly organized healthcare systems, it should be the direction that optimal antenatal care should take.

Patient Prescription

To avoid communication errors, it is advisable that the referring clinician should hand over a written prescription for the study to the patient and ask the patient to submit it when she goes for the study. The facility where the scan is conducted should also request for such a prescription. This is legally mandatory in India. In an emergency, if such a written document is not available or in awareness-restricted areas such as patients coming from remote areas, it is advisable to obtain a telephonic clarification from the treating caregiver and obtain the prescription at a later date.

When in Pregnancy, Should an Anomalies Scan be Carried Out?

The detailed anomalies evaluation is performed between 18 to 24 weeks of gestation in most countries. Since the Medical Termination of Pregnancy Act in India does not permit termination of pregnancy after 20 weeks of gestation, the scan has to be performed between 18 and 20 weeks. Although anomalies may be detected as early as 10 weeks of gestation, it must be remembered that sensitivity for the detection of structural malformations improves with advancing gestational age in the second trimester. The sensitivity of detection is far superior at 22–24 weeks compared to 18–20 weeks of gestation. Several anomalies may not be evident in the second trimester and would need to be looked for in later scans including third trimester scans. A third trimester anomalies scan, is not, however, mandatory. If for any reason, scans are performed between 14 and 17 weeks of gestation, such as in suspected anomalies in the late first trimester scan or with an abnormal result from biochemical genetic screening or non invasive prenatal testing, the anatomic survey must be repeated between 18 to 24 weeks of gestation. Serial evaluations may be necessary in several clinical situations and also because of obese/hirsute maternal habitus and fetal position and these are encouraged. When the scan is limited by maternal habitus or fetal position, this should be documented in the report, and serial scans be suggested.

The period of gestation at which the second trimester anomalies scan should be performed, should therefore be a balance between

- the legal age for termination of pregnancy,
- ability to visualize anomalies at that period of gestation,
- patient habitus, and
- time needed for counseling and further investigations in case an abnormality is evident.

It must also be remembered that all scans between 18 to 24 weeks are not detailed anomalies scans and may be just growth scans or scans done for specific clinical scenarios. If a scan done between 18 to 24 weeks is not an anomalies scan this should be documented in the report.

It is reiterated that while it is not possible to detect all structural congenital anomalies with ultrasound, adherence to these guidelines will maximize the possibility of detecting many fetal abnormalities.

Ultrasound Equipment

The anomalies scan depends heavily on operator expertise and on equipment. Although technologically high-end equipment is easier to use and permits a faster throughput, an expert can produce equally good results on a medium-end machine. High-end equipment with its variety of transducers, elaborate software applications, color Doppler, power Doppler, three dimensional (3D) and real time 3D (4D) capabilities ensures that the patient does not have to wait for days or weeks for a final opinion in specific situations. High-end equipment also makes for more convenient storing of images and electronic transmission. The bulk of work in an anomalies scan can be achieved without high-end equipment.

Personnel Qualifications

This is dictated entirely by local laws as modified from time to time and by state medical councils.

Image Documentation

Image documentation should aim to be as exhaustive as possible. This can often be restrained by economic considerations. Although electronic documentation is simple to use, inexpensive and permanent, it is forbidden by law in some areas. Paper prints or X-ray film documentation are completely acceptable and convenient for review by referring physicians. Many jurisdictions demand storage for a minimum period of time. In the final analysis,

documenting a real time study in still images is always a compromise, and the extent of documentation is left to the discretion of the qualified operator.

Reporting Findings

Reporting formats differ all over the world. These vary from checklists to a description list to a single sentence. The aim is to communicate the findings to the caregiver. It needs to be considered that the report of an anomalies scan in a changing medico-legal scenario needs to be a legal document as well, and a changed approach to reporting is emerging to cover this aspect. Operators should, therefore, consider including any one of the following

- A single sentence of the absence of anomalies followed by a sentence on the protocol followed e.g. “Society of Fetal Medicine, 2013”
- A checklist
- A detailed description

Suboptimal Examinations

An operator may occasionally find an examination suboptimal because of fetal position, maternal habitus or equipment considerations. This should be recorded in the report. In this circumstance, appropriate recommendations for serial evaluation, a referral for a second opinion, or, referral to a centre with appropriate equipment and expertise should also be documented in the report. It is recommended that this matter should not be left to verbal communication alone.

Fetal Safety

Ultrasound is generally considered safe during pregnancy [5]. It should, however, only be performed for a valid medical indication [2]. The lowest possible energy and time exposure should be used to obtain necessary information [1].

Protocol for the Second Trimester Anomalies Scan

The second trimester scan includes three components. These are a detailed anatomical evaluation of the fetus, fetal biometry, and, an evaluation of the fetal environment.

The use of high frequency transducers, transvaginal scanning, color and power Doppler studies and 3D and real-time three-dimensional scans enhance accuracy in several situations and is encouraged but not mandatory.

The study should document the following:

- Fetal number,
- Chorionicity and amnionicity in case of multiple gestations,
- Fetal cardiac activity,
- Fetal biometry as recommended in the following sections,
- Estimation of fetal weight,
- A detailed fetal anatomic survey as recommended in the following sections, and
- Evaluation of the fetal environment including the placenta, amniotic fluid, umbilical cord and maternal uterus, cervix and adnexa, as recommended in the following sections.

Fetal biometry should include the following measurements:

- Biparietal diameter (BPD) measured from the leading edge to the leading edge of the osseous margins of the cranium in an axial section that includes the cavum septum pellucidum and the thalami,
- Head perimeter at the same level as the BPD, traced at the outer margin of the osseous skull vault,
- Occipito-frontal distance at the same level as the BPD, from the anterior edge of the osseous surface to the posterior edge of the osseous surface on the outer aspect,
- Abdominal perimeter (AP) measured in a transverse view of the abdomen at the level of the junction of the umbilical vein and portal vein anteriorly and the spine in a true transverse section posteriorly,
- Femur length that includes the shaft only; vertical orientation of the bone is inappropriate. Measurements are to be taken end to end, and, if both femora are seen in the same plane, the bone in the near field is to be measured,
- The cerebellar transverse diameter at the maximum axial extent of the cerebellum.

Every effort must be made to obtain ideal planes for measurement. If these are not possible, several of the sub-optimal planes described in literature may be used. However, the compromise on an ideal view should be mentioned in the report. The following measurements are not mandatory but encouraged in appropriate clinical situations and serve the purpose of objectivity in anomalies detection:

- Humeral length
- Radial length, ulnar length, tibial length, fibular length, foot length and clavicular length,
- Depth of the cisterna magna,
- Width of the atrium of the lateral ventricle,
- Nasal bone length
- Binocular distance, interocular distance and orbital diameter

- Lung length, and,
- Kidney length.

The nuchal skin fold should be necessarily measured. This is ideally measured in an axial section showing the fold and including the cerebellum and cavum septum pellucidum.

Fetal weight estimates should be derived from customized charts, or in case these are not available, from standard charts. The chart used should be quoted in the report/report-table. Measurements should include cranial measurements, AP and femoral length. Deviation of measurements from norm has traditionally been reported as equivalents in weeks and days. There is a recent trend of reporting deviations as centiles and this is encouraged.

The evaluation of the fetal environment includes assessment of the amniotic fluid, the umbilical cord, the placenta, the cervix and the myometrium and adnexa. The evaluation of amniotic fluid includes assessing quantity and echogenicity. Measurements are not mandatory but encouraged to facilitate serial evaluation. The quantification may be done by assessing the amniotic fluid index or the maximum vertical pocket. The index is the sum of the deepest fluid pocket in each of four quadrants of the uterus. The pockets should be free of fetal limbs and the umbilical cord. In multifetal pregnancies the maximum vertical pocket should be measured in each amniotic sac. If the amniotic fluid is excessively echogenic this should be mentioned in the report.

The umbilical cord should be assessed for the number of vessels, its point of origin and its point of insertion. Masses in the umbilical cord, if any, should be noted. Cord length is unreliable to assess but a short cord if noted should be documented. Placental evaluation should include location, echogenicity, thickness and the retroplacental area. Accessory lobes should be looked for and noted if present. Location includes a measurement of the distance of the inferior margin of the placenta from the internal os. Focal areas of altered echogenicity should be characterized if possible and noted. Assessment of placental thickness is subjective. Abnormally thin or thick placentas should be documented and maximum thickness should be measured in these situations. Although the sensitivity of ultrasound for assessing abnormal invasion of the myometrium by the placenta is poor, an attempt should be made to assess this.

The myometrium should be assessed for fibroids and any thinning of previous scars. Any maternal adnexal mass should be noted and characterized if possible. The cervix should be assessed for its length and for a closed internal os. Emerging evidence suggests that a transvaginal scan is more accurate for this assessment and future direction is awaited.

The anomalies survey is the most significant component of the second trimester fetal study. A systematic and

meticulous approach is necessary. This should not be limited by time constraints. Low-end equipment with its lower resolution is often inadequate for an adequate study. At the same time, very high-end technology is not necessary but encouraged.

The cranium should be assessed for shape, ossification and bony defects. The intracranial anatomic survey should include a subjective assessment of symmetry, the falx, cavum septum pellucidum, thalami, cerebellum, cisterna magna, the third ventricle, lateral ventricles and early sulcation of the cerebrum. Any focal abnormalities in the cerebrum should be noted. Deviations from norm should be reported.

The nuchal skin fold should be measured from the outer margin of skin to the surface of the occipital bone.

The anatomic survey of the face should include an assessment of the slope of the forehead, the orbit, eyelids, lens, nasal bone, nasal configuration, upper lip, lower lip, maxilla, mandible, cheek and chin. Location and configuration of the external ear is required only in specific clinical scenarios and does not form part of routine anomalies evaluation

The neck should be assessed for anterior, posterior or lateral masses.

The spine including the osseous components, soft tissues and skin should be assessed in longitudinal, coronal and axial sections.

The thorax should be systematically assessed for the chest wall, lungs, heart, mediastinum and diaphragm. The chest wall should include the ribs, scapula and clavicles. The cardiac survey should include cardiac situs, size, axis, rate, rhythm, four-chamber view, outflows and the three vessel/three vessel trachea view. The lungs should be assessed for extent and echogenicity. The mediastinum should be evaluated for masses and displacements. The diaphragm and interruptions should be looked for.

Anatomical assessment of the abdomen should include observing visceral situs, the anterior and posterior abdominal wall, filling and emptying of the stomach, bowel echogenicity, size and echogenicity of the liver and spleen, abnormal masses if any, kidney location, contour and echogenicity, urinary dilatation if any and the urinary bladder in a full and empty phase.

Evaluation of fetal genitalia should be considered only in the perspective of sex related disorders and in the context of local legislation.

The extremities should be assessed for the presence of bones and soft tissues in the proximal, middle and distal segments of both upper limbs and both lower limbs. Counting of the digits does not form part of the anomalies protocol. Clinodactyly and sandal-gap deformity should be looked for. Movements should be surveyed.

Concluding Comment

Each guideline in this document has undergone extensive discussion followed by a consensus. In a rapidly evolving technological and research environment, it is imperative to constantly re-evaluate and update these guidelines. Practitioners are advised to be aware of these updates and incorporate these into their daily practice.

Conflict of interest None.

References

1. American Institute of Ultrasound in Medicine. AIUM practice guidelines for the performance of obstetric ultrasound examination. *J Ultrasound Med.* 2010;29:157–66.
2. American College of Radiology (ACR) and American College of Obstetrics and Gynecology (ACOG). ACR practice guideline for communication of diagnostic imaging findings. ACR 2010. Resolution 11.
3. Royal College of Obstetricians and Gynaecologists. Supplement to ultrasound screening for fetal abnormalities. London: RCOG; 2000.
4. Salomon LJ, Alfirevic Z, Berghella V, Bilardo C, Hernandez-Andrade E, Johnsen SL, et al. Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. *Ultrasound Obstet Gynecol.* 2011;37:116–26.
5. Abramowicz JS, Kossoff G, Marsal K, Ter Haar G. Safety statement, 2000 (reconfirmed 2003). International Society of Ultrasound in Obstetrics and Gynecology (ISUOG). *Ultrasound Obstet Gynecol.* 2003;21:100.