The American Institute of Ultrasound in Medicine (AIUM) is a multidisciplinary association dedicated to advancing the safe and effective use of ultrasound in medicine through professional and public education, research, development of guidelines, and accreditation. To promote this mission, the AIUM is pleased to publish, in conjunction with the American College of Radiology (ACR), this AIUM Practice Guideline for the Performance of an Ultrasound Examination for Detection and Assessment of Developmental Dysplasia of the Hip. We are indebted to the many volunteers who contributed their time, knowledge, and energy to bringing this document to completion.

The AIUM represents the entire range of clinical and basic science interests in medical diagnostic ultrasound, and, with hundreds of volunteers, the AIUM has promoted the safe and effective use of ultrasound in clinical medicine for more than 50 years. This document and others like it will continue to advance this mission.

Practice guidelines of the AIUM are intended to provide the medical ultrasound community with guidelines for the performance and recording of high-quality ultrasound examinations. The guidelines reflect what the AIUM considers the minimum criteria for a complete examination in each area but are not intended to establish a legal standard of care. AIUM-accredited practices are expected to generally follow the guidelines with recognition that deviations from these guidelines will be needed in some cases, depending on patient needs and available equipment. Practices are encouraged to go beyond the guidelines to provide additional service and information as needed.
I. Introduction
The clinical aspects contained in specific sections of this guideline (Introduction, Indications/Contraindications and Timing, Specifications of the Examination, and Equipment Specifications) were revised collaboratively by the American Institute of Ultrasound in Medicine (AIUM) and the American College of Radiology (ACR). Recommendations for physician requirements, the written request for the examination, procedure documentation, and quality control vary between the two organizations and are addressed by each separately.

This guideline has been developed to assist practitioners performing sonographic studies for detection of developmental dysplasia of the hip (DDH). Adherence to the following guideline will maximize the probability of detecting most of the abnormalities that relate to hip position, hip stability, and development of the acetabulum.

Ultrasound is the preferred method for diagnostic imaging of the immature hip when available. It affords direct visualization of the cartilaginous components of the hip joint. The value of ultrasound diminishes as the femoral head ossifies. For patients between 6 months and 1 year of age, radiography becomes more reliable. Usually by 1 year of age, the femoral head is sufficiently ossified to prevent good visualization of the acetabulum with ultrasound. If the triradiate cartilage cannot be visualized sonographically, radiography is needed.

II. Indications/Contraindications and Timing
Indications for ultrasound of the infant hip include but are not limited to:

1. Abnormal findings on physical or imaging examination of the hip.
2. Monitoring of patients with DDH treated with a Pavlik harness or other splint device.
3. Any family history of DDH.
4. Breech presentation regardless of sex.
5. Oligohydramnios and other intrauterine causes of postural molding.

Two of the strongest risk factors for DDH are a female neonate with a frank breech presentation at birth and a family history of both a parent and a sibling with DDH. These patients should undergo ultrasound screening at 3 to 4 weeks after birth.

There are no absolute contraindications to ultrasound of the infant hip for DDH, but as discussed above, the study becomes less reliable compared to radiography as ossification of the femoral head progresses. Because of the presence of physiologic laxity, hip sonography is not performed on patients younger than 3 to 4 weeks, unless there are clinical findings indicative of dislocation or significant instability.

III. Qualifications and Responsibilities of Personnel
See the AIUM Official Statement Training Guidelines for Physicians Who Evaluate and Interpret Diagnostic Ultrasound Examinations and the AIUM Standards and Guidelines for the Accreditation of Ultrasound Practices.

IV. Written Request for the Examination
The written or electronic request for an ultrasound examination should provide sufficient information to allow for the appropriate performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider or under their direction. The accompanying clinical information should be provided by a physician or other appropriate health care provider familiar with the patient's clinical situation and should be consistent with relevant legal and local health care facility requirements.

V. Specifications of the Examination
The diagnostic examination for DDH incorporates 2 orthogonal planes. Both hips should be examined. The diagnostic examination should include a coronal view in the standard plane at rest and a transverse view of the flexed hip with and without stress. This enables an assessment of hip position, stability, and morphology when the study is correctly performed and interpreted. When performing a complete examination, if position, stability, and/or morphology cannot be assessed, the report should state the portion not done. A limited examination consists of only 1 imaging plane and no manipulation. It is acceptable to perform the standard examination with the infant in a supine or lateral position. If the examiner chooses, additional views and maneuvers can be obtained. Morphology is assessed at rest. Stress maneuvers follow those prescribed in the...
clinical examination of the hip (Barlow and Ortolani tests) and assess femoral stability. If the femoral head is subluxable or dislocatable, reducibility can be assessed. It is important that the infant be relaxed when hips are assessed for instability. Feeding the infant during the examination can increase comfort and cooperation.

A. Coronal View

The anatomic coronal plane is approximately parallel to the posterior skin surface of an infant. If the superior edge of the transducer is rotated 10° to 15° (usually posteriorly) into an oblique coronal plane, the ilium will appear straight, and after adjustment to ensure that the imaging plane is through the deepest part of the acetabulum, the resulting image will be a coronal view in the standard plane.

The standard plane is defined by identifying a straight iliac line, the tip of the acetabular labrum, and the transition from the os ilium to the triradiate cartilage (Figure 1). The coronal view in the standard plane can be performed with the hip in the physiologic neutral (15°–20° flexion) or flexed position during treatment. Femoral head position and displacement are noted. Acetabular morphology is assessed in this view. Validation by angle and femoral head coverage measurement is optional. Performance of stress in this plane is also optional.

B. Transverse Flexion View

The examination is performed with the hip flexed at 90°. The transverse plane is the anatomic transverse or axial plane (similar to the plane of a primary computed tomographic image; Figure 2). The hip is tested for position at rest with passive abduction and adduction. Next, gentle stress is applied to assess stability. (Caution: application of stress is omitted when hips are being examined in a Pavlik harness or splint device unless otherwise requested by the orthopedic surgeon.) The transducer is posterolateral so that imaging can be accomplished while the hip is abducted and adducted (Ortolani and Barlow maneuvers). If the relationship of the femoral head to the posterior acetabulum changes with gentle stress, the hip is unstable. Other orthopedic stress maneuvers described in the literature are optional.

C. Modification of the Diagnostic Examination

The supervising physician may modify the examination depending on clinical circumstances, such as during or after treatment for DDH. In such cases, a coronal view in the standard plane can be performed. If it is abnormal, a complete diagnostic examination is recommended.

Figure 1. Coronal view of the hip joint in the standard plane with the hip in the physiologic neutral position (usually 15°–20° of hip flexion).

A. Coronal anatomic illustration.  B. Coronal ultrasound image.

Ac indicates acetabular cartilage; C, capsule; G, gluteus muscles; GT, greater trochanter; H, cartilaginous femoral head; IL, ilium; Is, ischium; L, labrum; LT/P, ligamentum teres/pulvinar complex; M, femoral metaphysis; and Tr, triradiate cartilage.
VI. Documentation

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should be accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, and side (right or left) of the anatomic site imaged. An official interpretation (final report) of the ultrasound findings should be included in the patient’s medical record. Retention of the ultrasound examination should be consistent both with clinical needs and with relevant legal and local health care facility requirements.

Reporting should be in accordance with the AIUM Practice Guideline for Documentation of an Ultrasound Examination.

VII. Equipment Specifications

Hip ultrasound for detecting DDH should be performed with the highest frequency transducer, preferably a linear array transducer that permits penetration of the soft tissues. Acetabular measurements reported in the literature are made with a linear transducer. Total ultrasound exposure should be kept as low as reasonably achievable (ALARA) while optimizing diagnostic information.

Figure 2. Transverse view of the hip flexed 90° at the hip.

A. Transverse anatomic illustration.

B. Transverse ultrasound image.

Ac indicates acetabular cartilage; G, gluteus muscles; GT, greater trochanter; H, cartilaginous femoral head; Is, ischium; L, labrum; LT/P, ligamentum teres/pulvinar complex; M, femoral metaphysis; Pu, pubis; and Tr, triradiate cartilage.

VIII. Quality Control and Improvement, Safety, Infection Control, and Patient Education Concerns

Policies and procedures related to quality control, patient education, infection control, and safety should be developed and implemented in accordance with the AIUM Standards and Guidelines for the Accreditation of Ultrasound Practices.

Equipment performance monitoring should be in accordance with the AIUM Standards and Guidelines for the Accreditation of Ultrasound Practices.

Acknowledgments

This guideline was revised by the American Institute of Ultrasound in Medicine (AIUM) in collaboration with the American College of Radiology (ACR), according to the process described in the AIUM Clinical Standards Committee Manual.

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References


