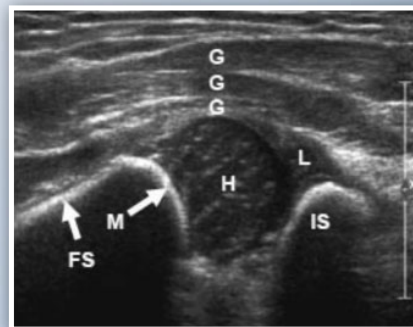
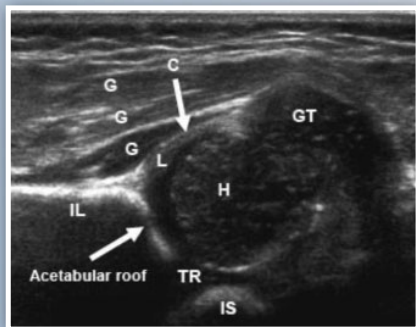


AIUM Practice Guideline for the Performance of an

Ultrasound Examination for Detection and Assessment of Developmental Dysplasia of the Hip

*Guideline developed in conjunction with the American College of Radiology (ACR),
the Society for Pediatric Radiology (SPR), and the Society of Radiologists
in Ultrasound (SRU).*



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The American Institute of Ultrasound in Medicine (AIUM) is a multi-disciplinary 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), the Society for Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU), 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.



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2013—AIUM PRACTICE GUIDELINE—Developmental Dysplasia of the Hip

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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), the American College of Radiology (ACR), the Society for Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU). Recommendations for personnel requirements, written request for the examination, procedure documentation, and quality control vary among the organizations and are addressed by each separately.

This guideline is intended to assist practitioners performing sonographic studies for detection and assessment of developmental dysplasia of the hip (DDH). Adherence to the following recommendations will maximize the probability of detecting most of the abnormalities that relate to acetabular morphology, the position of the femoral head, and stability.

Ultrasound is the preferred method for diagnostic imaging of the immature hip, when available.^{1,2} It affords direct visualization of the cartilaginous components of the hip joint. The value of ultrasound diminishes as the femoral head ossifies; therefore, radiography is preferable for patients 6 months of age or older, unless the acetabulum (including the triradiate cartilage) is adequately visualized sonographically.

II. Indications/Contraindications and Timing

Indications for ultrasound of the infant hip include but are not limited to:

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

Two of the strongest risk factors for DDH are a female newborn with a frank breech presentation at birth and a family history of a parent and/or sibling with DDH.³ It is recommended that these patients undergo ultrasound screening at 4 to 6 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. Due to the presence of physiologic laxity, hip sonography is not performed on patients younger than 3 to 4 weeks of age, unless there are clinical findings indicative of dislocation or significant instability.⁴

III. Qualifications and Responsibilities of Personnel

See www.aium.org for AIUM Official Statements including *Standards and Guidelines for the Accreditation of Ultrasound Practices* and relevant Physician Training Guidelines.

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 the provider's 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^{5,6}

Both hips should be examined. The diagnostic examination for DDH incorporates 2 orthogonal planes: 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. If position, stability, and/or morphology cannot be assessed when attempting to perform a complete examination, the report should note the portion not done. It is acceptable to perform the examination with the infant in a supine or a lateral decubitus position

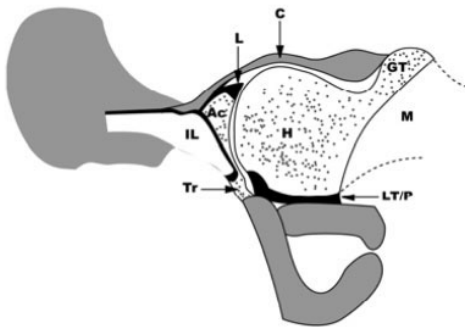
Morphology is assessed at rest. The stress maneuver (posterior push maneuver) is performed to evaluate for hip instability with the hip and knee flexed and the thigh adducted (Barlow maneuver). If the femoral head is subluxated, subluxable, dislocated, or dislocatable, reducibility can be assessed by abducting and externally rotating the hip (Ortolani maneuver). If the examiner chooses, additional views and maneuvers can be obtained. 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. (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.)⁷

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. After adjustment to ensure that the imaging plane is through the deepest part of the acetabulum (which includes visualization of the triradiate cartilage and the ischium posteriorly), 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 obtained with the hip in the physiologic neutral position (15°–20° flexion) or in the flexed position. The femoral head position and displacement are noted. Acetabular morphology is assessed in this view and may be validated by measuring the acetabular alpha angle ($\geq 60^\circ$). Validation by angle and femoral head coverage measurement is optional.⁷ Performance of stress in this plane is also optional.

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).

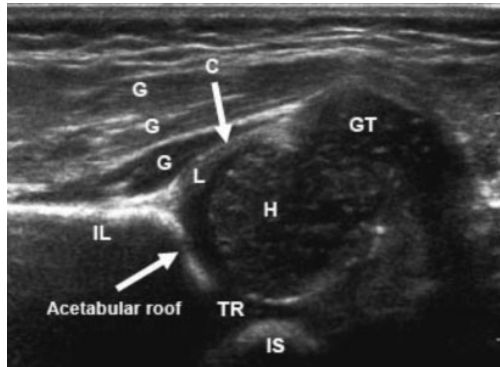


Concept by Neil Johnson, MD
Illustration by Glenn Milano

A, Coronal anatomic illustration. Ac indicates acetabular cartilage; C, capsule; GT, greater trochanter; H, cartilaginous femoral head; IL, ilium; L, labrum; LT/P, ligamentum teres/pulvinar complex; M, femoral metaphysis; and Tr, triradiate cartilage.



B, Coronal view. The ultrasound transducer is placed parallel to the lateral aspect of the infant's hip.

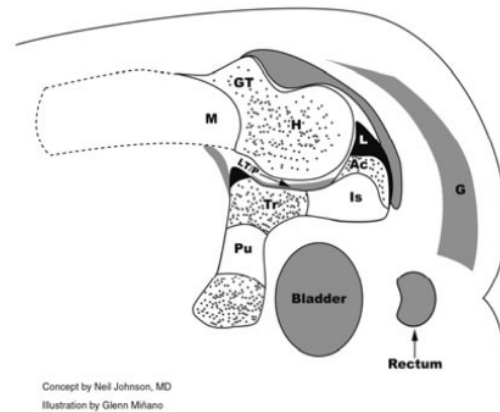


C, Coronal ultrasound image. C indicates capsule; G, gluteus muscles; H, cartilaginous femoral head; IL, ilium; IS, ischium; TR, triradiate cartilage; GT, greater trochanter; and L labrum.

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 an axial computed tomographic image; Figure 2). The femoral shaft is seen anteriorly, terminating in the femoral head, which rests on the ischium. The hip is tested for position at rest with passive abduction and adduction. Next, gentle stress is applied to assess stability.⁷ The transducer is placed in a posterolateral position 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.

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



A, Transverse anatomic illustration. 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.

Concept by Neil Johnson, MD
 Illustration by Glenn Milano



B, Transverse flexion view. The hip and knee are flexed 90°, and the ultrasound transducer is placed perpendicular to the lateral aspect of the infant's hip.



C, Transverse ultrasound image. G indicates gluteus muscles; H, cartilaginous femoral head; IS, ischium; L, labrum; M, femoral metaphysis; and FS, femoral shaft.

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.

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

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

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*.

IX. ALARA Principle

The potential benefits and risks of each examination should be considered. The ALARA (as low as reasonably achievable) principle should be observed when adjusting controls that affect the acoustic output and by considering transducer dwell times. Further details on ALARA may be found in the AIUM publication *Medical Ultrasound Safety*, Second Edition.

Acknowledgments

This guideline was revised by the AIUM in collaboration with the American College of Radiology (ACR), the Society for Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU) according to the process described in the *AIUM Clinical Standards Committee Manual*.

Collaborative Committees

Members represent their societies in the initial version and final revision of this guideline.

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