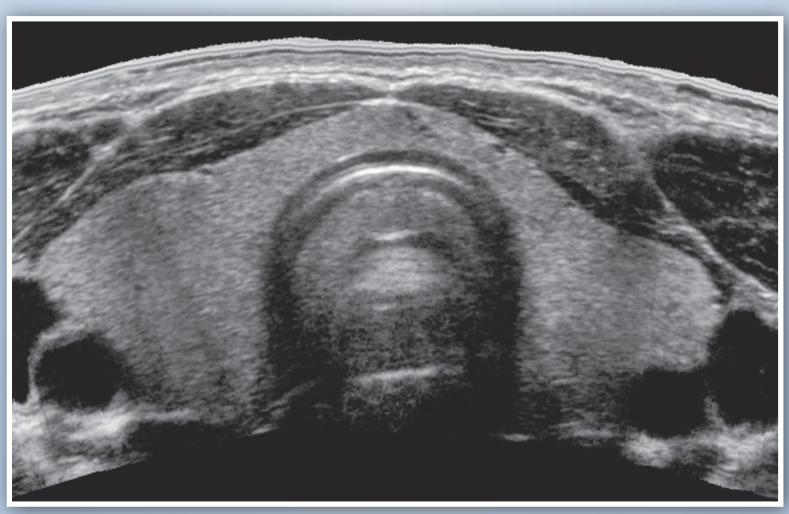
AIUM Practice Parameter for the Performance of a

Thyroid and Parathyroid Ultrasound Examination

Parameter 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 multidisciplinary association dedicated to advancing the safe and effective use of ultrasound in medicine through professional and public education, research, development of parameters, 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 revised *AIUM Practice Parameter for the Performance of a Thyroid and Parathyroid Ultrasound Examination*. 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 parameters of the AIUM are intended to provide the medical ultrasound community with parameters for the performance and recording of high-quality ultrasound examinations. The parameters 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 parameters with recognition that deviations from these parameters will be needed in some cases, depending on patient needs and available equipment. Practices are encouraged to go beyond the parameters to provide additional service and information as needed.

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I. Introduction

The clinical aspects contained in specific sections of this parameter (Introduction, Indications, 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 parameter is intended to assist practitioners performing sonographic evaluations of the thyroid gland, parathyroid glands, and adjacent soft tissues. Occasionally, an additional and/or specialized examination with another modality may be necessary. While it is not possible to detect every abnormality, adherence to the following parameters will maximize the probability of detecting most abnormalities that occur in the thyroid and parathyroid glands.

II. Indications

Indications for a thyroid and parathyroid ultrasound examination include but are not limited to[1]:

1. Evaluation of the location and characteristics of palpable neck masses, including an enlarged thyroid;
2. Evaluation of abnormalities detected by other imaging examinations, eg, a thyroid nodule detected on computed tomography, positron emission tomography–computed tomography, or magnetic resonance imaging, or seen on another ultrasound examination of the neck (eg, carotid ultrasound);
3. Evaluation of laboratory abnormalities;
4. Evaluation of the presence, size, and location of the thyroid gland;
5. Evaluation of patients at high risk for occult thyroid malignancy;
6. Follow-up imaging of previously detected thyroid nodules, when indicated;
7. Evaluation for regional nodal metastases in patients with proven or suspected thyroid carcinoma before thyroidectomy;
8. Evaluation for recurrent disease or regional nodal metastases after total or partial thyroidectomy for thyroid carcinoma;
9. Evaluation of the thyroid gland for suspicious nodules before neck surgery for nonthyroid disease[2];
10. Evaluation of the thyroid gland for suspicious nodules before radioiodine ablation of the gland;

11. Identification and localization of parathyroid abnormalities in patients with known or suspected hyperparathyroidism[3,4];
12. Assessment of the number and size of enlarged parathyroid glands in patients who have undergone previous parathyroid surgery or ablative therapy with recurrent symptoms of hyperparathyroidism;
13. Localization of thyroid/parathyroid abnormalities or adjacent cervical lymph nodes for biopsy, ablation, or other interventional procedures; and
14. Localization of autologous parathyroid gland implants.

III. Qualifications and Responsibilities of Personnel

See the AIUM Official Statement T*raining Guidelines for Physicians Who Evaluate and Interpret Diagnostic Thyroid/Parathyroid 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 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 Examinations

A. The Thyroid Examination

The examination should be performed with the neck in hyperextension. The right and left lobes of the thyroid gland should be imaged in the longitudinal and transverse planes. Recorded images of the thyroid should include transverse images of the superior, mid, and inferior portions of the right and left thyroid lobes; longitudinal images of the medial, mid, and lateral portions of both lobes; and at least a transverse image of the isthmus. The size of each thyroid lobe should be recorded in 3 dimensions, anteroposterior, transverse, and longitudinal. The thickness (anteroposterior measurement) of the isthmus on the transverse view should be recorded. A color or power Doppler examination can be used to supplement the grayscale evaluation of either diffuse or focal abnormalities of the thyroid. It is often necessary to extend imaging to include the soft tissue above the isthmus (eg, to evaluate a possible pyramidal lobe

of the thyroid), congenital abnormalities such as a thyroglossal duct cyst, or if any superior palpable abnormality is noted. The examination should also include a brief evaluation of the lateral neck compartments.

Thyroid abnormalities should be imaged in a way that allows for reporting and documentation of the following:

1. The location, size, number, and character of significant abnormalities, including measurements of nodules and focal abnormalities in 3 dimensions;
2. The localized or diffuse nature of any thyroid abnormality, including assessment of overall gland vascularity[5,6];
3. The sonographic features of any thyroid abnormality with respect to echogenicity, composition (degree of cystic change), margins (smooth or irregular), presence and type of calcification (if present), and other relevant sonographic patterns[7–19]; and
4. The presence and size of any abnormal lymph node in the lateral compartment of the neck (see section B below).

In patients who have undergone complete or partial thyroidectomy, the thyroid bed should be imaged in transverse and longitudinal planes. Any masses or cysts in the region of the bed should be measured and reported. Additionally, the lateral neck should be evaluated as described in section B.

Whenever possible, comparison should be made with other appropriate imaging studies.

Sonographic guidance may be used for aspiration or biopsy of thyroid abnormalities or other masses of the neck or for other interventional procedures.[20–22]

B. The Cervical Lymph Node Evaluation

A high-resolution ultrasound examination of the neck is used for the staging of patients with thyroid cancer and other head and neck cancers and in the surveillance of patients after treatment of such cancers.[23–29] In these patients, the size and location of abnormal lymph nodes should be documented. Suspicious features such as calcification, cystic areas, absence of a central hilum, round shape, and abnormal blood flow should be documented. The location of an abnormal lymph node should be described according to the image-based nodal classification system developed by Som et al,[30] which corresponds to the clinical nodal classification system developed by the American Joint Committee on Cancer and the American Academy of Otolaryngology–Head and Neck Surgery, or in a fashion that allows the referring clinician to convert the location of abnormal nodes to that system.

C. The Parathyroid Examination

An examination for suspected parathyroid enlargement should include images in the region of the anticipated parathyroid gland location. One of the important uses of parathyroid ultrasound is to try to localize parathyroid adenomas in patients with primary hyperparathyroidism to help with surgical planning.[3,4]

The examination should be performed with the neck hyperextended and should include longitudinal and transverse images from the carotid arteries to the midline bilaterally and extending from the carotid artery bifurcation superiorly to the thoracic inlet inferiorly. As parathyroid glands may be hidden below the clavicles in the lower neck and upper mediastinum, it may also be helpful to have the patient swallow during the examination with constant real-time observation. Color and/or power or spectral Doppler ultrasound may be helpful. The upper mediastinum may be imaged with an appropriate probe by angling under the sternum from the sternal notch. Rarely, parathyroid adenomas may also be intrathyroidal. Although the normal parathyroid glands are usually not visualized with available sonographic technology, enlarged parathyroid glands may be visualized. When visualized, their location, size, and number should be documented, and measurements should be made in 3 dimensions. The relationship of any visualized parathyroid gland(s) to the thyroid gland should be documented, if applicable.[2,31,32]

Whenever possible, comparison should be made with other appropriate imaging studies.

Sonographic guidance may be used for aspiration or biopsy of parathyroid abnormalities or other masses of the neck or for other interventional procedures.

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 Parameter for Documentation of an Ultrasound Examination.*

VII. Equipment Specifications

Thyroid and parathyroid studies should be conducted with a linear transducer. The equipment should be adjusted to operate at the highest clinically appropriate frequency, realizing that there is a trade-off between resolution and beam penetration. For most patients, mean frequencies of 10 to 14 MHz or greater are preferred, though some patients may require a lower-frequency transducer for depth penetration. If the gland is deep or extremely enlarged, a curved linear transducer may be necessary. Resolution should be of sufficient quality to evaluate the internal morphology of visible lesions. Doppler frequencies should be set to optimize flow detection. Diagnostic information should be optimized while keeping total sonographic exposure as low as reasonably achievable.

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*, Third Edition.

Acknowledgments

This parameter 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 parameter.

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