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ACR–AIUM–SPR–SRU PRACTICE PARAMETER FOR THE PERFORMANCE AND INTERPRETATION OF DIAGNOSTIC ULTRASOUND OF THE EXTRACRANIAL HEAD AND NECK

PREAMBLE

This document is an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. Practice Parameters and Technical Standards are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care[1]. For these reasons and those set forth below, the American College of Radiology and our collaborating medical specialty societies caution against the use of these documents in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical physicist in light of all the circumstances presented. Thus, an approach that differs from the practice parameters, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the practice parameters when, in the reasonable judgment of the practitioner, such course of action is indicated by the condition of the patient, limitations of available resources, or advances in knowledge or technology subsequent to publication of the practice parameters. However, a practitioner who employs an approach substantially different from these practice parameters is advised to document in the patient record information sufficient to explain the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict with certainty a particular response to treatment. Therefore, it should be recognized that adherence to these practice parameters will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these practice parameters is to assist practitioners in achieving this objective.

[1] Iowa Medical Society and Iowa Society of Anesthesiologists v. Iowa Board of Nursing, ___ N.W.2d ___ (Iowa 2013) Iowa Supreme Court refuses to find that the *ACR Technical Standard for Management of the Use of Radiation in Fluoroscopic Procedures* (Revised 2008) sets a national standard for who may perform fluoroscopic procedures in light of the standard's stated purpose that ACR standards are educational tools and not intended to establish a legal standard of care. See also, Stanley v. McCarver, 63 P.3d 1076 (Ariz. App. 2003) where in a concurring opinion the Court stated that "published standards or guidelines of specialty medical organizations are useful in determining the duty owed or the standard of care applicable in a given situation" even though ACR standards themselves do not establish the standard of care.

I. INTRODUCTION

The clinical aspects contained in specific sections of this practice parameter (Introduction, Indications, Specifications of the Examination, and Equipment Specifications) were revised collaboratively by the American College of Radiology (ACR), the American Institute of Ultrasound in Medicine (AIUM), the Society of Pediatric Radiology (SPR), and the Society of Radiologists in Ultrasound (SRU). Recommendations for Qualifications and Responsibilities of Personnel, Written Request for the Examination, Documentation, and Quality Control and Improvement, Safety, Infection Control, and Patient Education vary among the organizations and are addressed by each separately

This practice parameter is intended to assist practitioners performing sonographic evaluation of the extracranial head and neck, including evaluation of the thyroid gland, parathyroid glands, parotid glands, submandibular glands, lymph nodes, and adjacent soft tissues. (Sonographic evaluation of the major vasculature of the neck is addressed in a separate practice parameter.) Occasionally, an additional and/or specialized examination with another modality may be necessary. Although it is not possible to detect every abnormality, adherence to the following practice parameters will maximize the probability of detecting most abnormalities that occur in the extracranial head and neck.

II. INDICATIONS

Indications for a thyroid and parathyroid head and neck ultrasound (US) examination include, but are not limited to [1]:

1. Evaluation of the location and characteristics of palpable neck masses.

2. Evaluation of abnormalities detected by other imaging examinations, eg, a thyroid nodule or other neck mass detected on computed tomography (CT), positron emission tomography (PET)-CT, magnetic resonance imaging (MRI), or seen on other ultrasounds (eg, carotid ultrasound) [1].

3. Evaluation for causes of relevant laboratory abnormalities, such as abnormalities of thyroid or parathyroid function.

4. Evaluation of the presence, size, and location of the thyroid gland [2].

5. Evaluation of patients at high risk for thyroid malignancy.

6. Imaging of previously detected thyroid nodules that meet criteria for follow-up imaging [3].

7. Evaluation for regional nodal metastases in patients with proven or suspected thyroid carcinoma prior to thyroidectomy [4].

8. Evaluation for recurrent disease or regional nodal metastases after total or partial thyroidectomy for thyroid carcinoma [5].

9. Evaluation of the thyroid gland for malignancy prior to neck surgery for nonthyroid disease [6].

10. Evaluation of the thyroid gland for malignancy prior to radioiodine ablation of the gland.

11. Assessment of the location, number, and size of enlarged parathyroid glands in patients with known or suspected hyperparathyroidism, or who have undergone previous parathyroid surgery or ablative therapy with recurrent signs or symptoms of hyperparathyroidism [7,8].

12. Guidance for aspiration or biopsy of thyroid abnormalities or other masses of the neck, or for other interventional procedures [9,10]

13. Localization of autologous parathyroid gland implants.

14. Evaluation of masses of the parotid and submandibular glands [11,12].

15. Evaluation of non-neoplastic conditions of the parotid and submandibular glands, including, but not limited to, sialolithiasis, infection, and autoimmune processes [13-15].

16. Nodal evaluation, including staging, evaluation of response to therapy, and monitoring after therapy, in select patients with head and neck malignancies, including, but not limited to, head and neck primary squamous cell carcinoma, primary salivary malignancy, and melanoma [16-18].

17. Evaluation for supraclavicular nodal metastasis in patients with lung cancer or other infra-clavicular primary malignancies at risk for metastasis [19,20].

18. Nodal evaluation in pediatric patients with cervical lymphadenopathy, including, but not limited to, evaluation for necrosis and abscess formation in the setting of acute lymphadenititis [21,22].

19. Imaging of sonographically accessible vascular anomalies (such as vascular tumors and vascular malformations) of the head and neck [23].

20. Evaluation of torticollis in neonates and infants [24] or other pediatric conditions including, but not limited to, thyroglossal duct cyst, branchial cleft cyst, lymphatic malformation, thymic ectopia/cyst, hemangioma, primary neck masses, including neurogenic tumors (neuroblastoma, schwannoma, neurofibroma), rhabdomyosarcoma, leukemia/lymphoma, metastatic disease (rhabdomyosarcoma, neuroblastoma, thyroid cancer) [25], and phlebectasia [26].

III. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL

See the ACR–SPR–SRU Practice Parameter for Performing and Interpreting Diagnostic Ultrasound Examinations [27].

IV. WRITTEN REQUEST FOR THE EXAMINATION

The written or electronic request for a neck ultrasound examination should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). Additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state's scope of practice requirements. (ACR Resolution 35 adopted in 2006 – revised in 2016, Resolution 12-b)

V. SPECIFICATIONS OF THE EXAMINATIONS

Sonographic evaluations of the neck may be comprehensive (including all of the structures described below) or may be problem focused, as appropriate for the patient and clinical scenario.

A. Thyroid Evaluation

The examination should be performed with the neck in hyperextension, with as much extension as tolerated by the patient. Upright positioning may be helpful in patients who cannot tolerate neck hyperextension in the supine

position. 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 a transverse image of the isthmus. The size of each thyroid lobe should be recorded in three dimensions: anteroposterior (AP), transverse, and longitudinal. The thickness (AP measurement) of the isthmus on the transverse view should be recorded. 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—for example, to evaluate a possible pyramidal lobe of the thyroid— to evaluate congenital abnormalities such as a thyroglossal duct cyst, or to investigate any superior palpable abnormality.

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

1. The localized or diffuse nature of any thyroid abnormality, including assessment of overall gland vascularity [28,29].

2. The sonographic features of any focal thyroid abnormality with respect to composition (degree of solid or cystic components), echogenicity, shape, size (in AP, transverse, and longitudinal dimensions), margins (smooth or irregular), presence and type of echogenic foci and/or calcifications (if present), other relevant sonographic patterns, and extra-thyroidal extension of lesion [9,30]. The ACR Thyroid Imaging, Reporting and Data System (TI-RADS) provides a lexicon for describing features of focal thyroid abnormalities with an associated management strategy [10,31,32].

   Examination of relevant neck compartments for adenopathy may be helpful in determining the need for biopsy in the setting of thyroid nodules. A comprehensive evaluation of cervical lymph nodes is needed for patients with known or suspected thyroid cancer for whom surgery is planned. This comprehensive evaluation may occur at the time of the initial thyroid ultrasound, the time of an ultrasound-guided biopsy, or as a separate preoperative ultrasound evaluation. Institutions are encouraged to have consistent practices to ensure that patients receive a comprehensive nodal evaluation when indicated (see section VB).

   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.

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

B. Cervical Lymph Node Evaluation

Sonographic examination of the cervical lymph nodes may be comprehensive or focused, as appropriate for the patient and clinical scenario. Therefore, the anatomic locations examined and extent of imaging documentation will vary based on the clinical indication. The size and location of any abnormal lymph nodes should be documented, and note should be made of any suspicious features such as calcification, cystic areas, absence of central hilum, round shape, and abnormal blood flow [33]. Location of the abnormal lymph node should be documented with annotations or enough visual information to describe the location according to the image-based 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 [34]. Node evaluation should be performed at centers with experienced personnel.

In the pediatric population, cervical lymph node evaluation is often performed as part of the evaluation of acute lymphadenitis. Lymph node size, echotexture, and vascularity should be documented, and note should be made of nodal suppuration or abscess formation [21,22].

C. Parathyroid Evaluation

Examination for suspected parathyroid enlargement should include images of the typical parathyroid gland locations, such as posterior to and just inferior to the thyroid gland. An examination of the thyroid and cervical nodes should be considered to evaluate for concomitant thyroid pathology and lateral neck adenopathy, which may be a relative contraindication to minimal invasive parathyroidectomy. One of the important uses of parathyroid ultrasound is to localize parathyroid adenomas in patients with primary hyperparathyroidism and to determine single-gland versus multiglandular enlargement, to help guide surgical planning [7,8,35].

The examination should be performed with the neck hyperextended and should include longitudinal and transverse images from the carotid arteries to the midline bilaterally, 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, and may also be retrotracheal in location, it may be helpful to have the patient swallow during the examination with constant real-time observation. Doppler ultrasound may be helpful. The upper mediastinum may be imaged with an appropriate transducer by angling inferiorly under the sternum from the sternal notch. Rarely, parathyroid adenomas may also be intrathyroidal. Although the normal parathyroid glands are usually not visualized using available sonographic technology, enlarged parathyroid glands may be visualized. When parathyroid abnormalities are visualized, their location, size, and number should be documented, and measurements should be made in three dimensions. The relationship of any visualized parathyroid gland(s) to the thyroid gland should be documented, if applicable [6,36].

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

D. Parotid and Submandibular Evaluation

Sonographic evaluation of the major salivary glands may be comprehensive or focused, as appropriate for the patient and clinical scenario. The parotid and submandibular glands are evaluated in two planes, although anatomic limitations due to the mandible and external ear often require oblique planes. A lower frequency transducer may be helpful to visualize the deep aspects of the parotid gland. Doppler may be added, when appropriate, for the evaluation of diffuse or focal abnormalities. Measurements of the parotid and submandibular glands can be performed when appropriate, such as evaluation of autoimmune disease or gland asymmetry. Salivary ductal dilation and calculi should be reported. When possible, a dilated salivary gland duct should be traced to the level of obstruction. Description of focal abnormalities within the salivary glands should include size in 3 dimensions as previously described, margins, echogenicity, composition, and internal blood flow. Abnormal-appearing intraparotid lymph nodes should be reported [37].

E. Sonographic Guidance of Head and Neck Procedures

Sonographic guidance may be used for aspiration and/or biopsy of thyroid/parathyroid/salivary abnormalities, lymph nodes or other masses of the head and neck, or for other interventional procedures [38].

VI. DOCUMENTATION

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Comparison with prior relevant imaging studies may prove helpful. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should generally be accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, and image orientation. An official interpretation (final report) of the ultrasound examination should be included in the patient's medical record. Retention of the ultrasound examination images should be consistent both with clinical need and with relevant legal and local health care facility requirements.

Reporting should be in accordance with the ACR Practice Parameter for Communication of Diagnostic Imaging Findings [39].

VII. EQUIPMENT SPECIFICATIONS

Extracranial head and neck ultrasound studies should be primarily 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. For evaluation of deep or large structures, a curved transducer may be necessary. For small superficial lesions, higher-frequency transducers, particularly those with a small footprint, may be necessary. Additionally, a curved linear transducer may be helpful for evaluation of the inferior aspect of the central neck to evaluate for inferior central or upper mediastinal adenopathy and inferior parathyroid glands (Section V-C). 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 IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education appearing under the heading *Position Statement on QC & Improvement, Safety, Infection Control, and Patient Education* on the ACR website (https://www.acr.org/Clinical-Resources/Practice-Parameters-and-Technical-Standards).

Equipment performance monitoring should be in accordance with the ACR-AAPM Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment [40].

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