

Ultrasound-Guided Salivary Gland Techniques and Interpretations



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KEYWORDS

- Salivary ultrasound • Ultrasound-guided salivary procedures • Ductal stricture • Sialolithiasis • Sjögren's syndrome
- Salivary swelling

KEY POINTS

- Ultrasound examination is standard in the initial evaluation of salivary disorders, providing a better assessment than palpation alone.
- Shortcomings include that the quality of assessment is operator and instrument dependent and it is inferior to sialography in the definition of salivary ductal anatomy.
- Ultrasound examination costs less and is more availability than computed tomography scan, MRI, and sialography without radiation exposure.
- Active research to advance the value of ultrasound examination includes the application of shear wave elastography and the use of contrast agents.

Introduction

Ultrasound imaging has become sufficiently diverse in its application that it is now performed more commonly by physicians outside the field of radiology than by radiologists. Most patients with a suspected abnormality of the salivary glands will benefit from a diagnostic ultrasound examination of the salivary glands and upper neck as part of their initial evaluation.¹ Improvements in the quality of imaging coupled with increased ease of performance have expanded use of salivary ultrasound examination not only to aid in diagnosis, but also in directing intervention.

Training to perform ultrasound examinations is offered in many surgical residency programs. Knowledge about the physics governing ultrasound imaging, the nomenclature used to describe findings, and the technical skills to use the equipment can be learned through courses sponsored by the American College of Surgeons and the American Academy of Otolaryngology. A synopsis of terminology and applications as well as information about the practice and reporting of salivary ultrasound are available on the Iowa Head and Neck Protocols Website (available: <https://medicine.uiowa.edu/iowaprotocols/salivary-ultrasound>) (accessed November 2017).²

Guidelines directing the reporting of diagnostic and interventional ultrasound procedures are available through the American Institute of Ultrasound in Medicine (AIUM) Practice

Guidelines (www.aim.org) "Documentation of an Ultrasound Examination."^{3,4} The AIUM identifies that ultrasound reports should record not only patient information and findings, but also the techniques and equipment used. These guidelines also affirm that "ultrasound images appropriate to the procedure being performed should be stored in the patient's medical record."

An approach to performing a diagnostic ultrasound examination is illustrated herein and includes an example of normal findings supplemented with an accompanying procedure note. Abnormal findings are presented and then followed by examples of interventional ultrasound techniques.

Technique

Preparation: indications

The indications for performing diagnostic salivary ultrasound are broad. A list of indications provided by the AIUM follows with the comment that they are "not limited to the following"⁵:

- Diffuse enlargement and tenderness consistent with inflammatory sialadenitis,
- Suspected abscess formation,
- Recurrent swelling suggesting Sjögren's disorder,
- Swelling with alimantation, suggestive of obstructing calculus,
- Discrete solitary mass suggestive of a benign or malignant neoplasm,
- Multiple masses, possibly consistent with cysts suggesting human immunodeficiency virus, and
- Anterior floor-of-the-mouth lesion, which may be solid or cystic, the latter suggestive of a simple or plunging ranula.

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Preparation: informed consent

The noninvasive nature of a diagnostic salivary ultrasound examination does not exempt the examiner from obtaining informed consent from the patient before performing the procedure. Verbal informed consent is sufficient for a diagnostic examination and, in our practice, is supplemented by a signed documentation of consent when ultrasound examination is used to direct another procedure such as salivary ductal dilation, needle biopsy, or injection.

Rare contraindications to diagnostic ultrasound examination include resistance by the patient to proceed, which may include pain, as can occur in the presence of acute inflammation. Anatomic variations such as postoperative or post-radiation changes that may compromise the capacity to perform a useful examination. The presence of a heavy beard may similarly make evaluation difficult, but may be partially overcome by liberal application of contrast gel.

Standard diagnostic approach

The approach to performing and recording a diagnostic ultrasound examination varies not only by institution, but also by physicians within an institution. Both diagnostic and interventional ultrasound studies that are done in our department of otolaryngology are performed by the otolaryngologist with a report generated that is accompanied by inclusion of images entered into the electronic record. The majority of diagnostic salivary ultrasound examinations done in the radiology department at our institution are physically performed by a technician. Standardized protocols direct the technician to generate still images and cine loops that are reviewed by the radiologist who then interprets them and creates a report. The radiologist physically handles the probe in the course of performing interventional ultrasound-directed procedures in the radiology department.

In the clinic setting, ultrasound examination is performed with the patient positioned comfortably in a slightly recumbent position with the neck slightly extended and the physician on the patient's right (for a right-handed surgeon) with access to controls for the ultrasound equipment with the left hand (Fig. 1).⁶



Fig. 1 The 14-5 MHz probe used with ultrasound unit performing diagnostic ultrasound examinations beginning with the upper anterior neck.

A linear transducer with a frequency of approximately 10 MHz is most useful for the salivary glands with our standard use of a variable frequency ranging from 5 to 14 MHz as our most commonly used probe. Although labeling of the anatomic site under evaluation can be recorded by typing or choosing a preset verbal description, the senior author's preference is to rely on the line drawing included on each image in the lower right corner that indicates not only the region under evaluation, but also the orientation of the probe permitting versatility to identify transverse, longitudinal, or in between angulation (Fig. 2).

We use a systematic approach beginning with imaging of the (a) submental region followed sequentially with imaging of the (b) right submandibular, (c) right parotid, (d) left submandibular, and then the (e) left parotid regions. Readily interpreted images generally result when a cooperative patient (no movement from respiration, swallowing, or speaking) is also thin (low fat content) and without altered anatomy from previous surgery. Improved technology to assist in selecting the depth of focus and time-gain compensation has improved ease in maximizing image quality. Images in this presentation are from unit with a 14-5 MHz probe (except for Figs. 7, 12, 13, and 16). The excellent quality of a high definition image of the upper anterior neck results from its being performed in a thin cooperative patient focused at 1.6 cm from the skin surface with a depth of 3 cm (see Fig. 2).

Generating a report

Procedure notes are directed by the AIUM Practice Parameter for the Documentation of an Ultrasound Examination with an example provided below in the Sample Procedure Note (available: <http://www.aium.org/resources/guidelines/documentation.pdf> accessed November 5, 2017).

Sample procedure note (corresponding with Figs. 2–5)

Procedure: Diagnostic ultrasound of the salivary glands and upper neck.

Preop Diagnosis: Status post I-131 therapy with left parotid swelling.

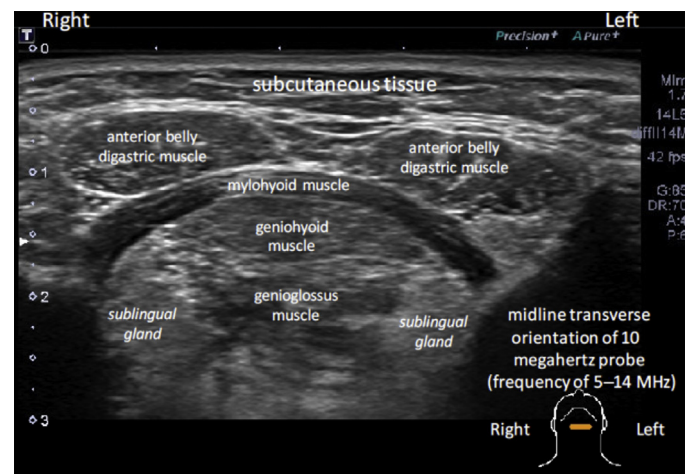


Fig. 2 Normal submental evaluation of midline upper anterior neck ultrasound unit with midline transverse orientation using 10 MHz (frequency range, 5–14 MHz) probe.

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