AMERICAN ACADEMY OF OTOLARYNGOLOGY–HEAD AND NECK SURGERY FOUNDATION

OTO Open
2022, Vol. 6(3) 1–4

DOI: 10.1177/2473974X221117545
http://oto-open.org
SAGE

Techniques in Otolaryngology: Ultrasound-Guided Transcervical Fine-Needle Aspiration of Laryngeal Masses

Olivia Quatela, MD[1*], Quinn Self, MD[1,2], Heather Herrington, MD[1,2], William Brundage, MD[1,2], Damon Silverman, MD[1,2], and Mirabelle Sajisevi, MD[1,2]

Abstract

Traditionally, laryngeal masses are diagnosed with direct laryngoscopy with biopsy under general anesthesia. The use of transcervical ultrasound–guided fine-needle aspiration for the diagnosis of base of tongue lesions, thyroid nodules, and cervical lymph node metastases has been well documented, and its use in the diagnosis of laryngeal masses has increased in recent years. We report a technique for office-based transcervical ultrasound–guided fine-needle aspiration for laryngeal masses without cervical metastasis (N0), with outcomes from 6 patients. Benefits of this approach included limited side effects, rapid in-office diagnosis, avoidance of aerosolizing procedures during the COVID-19 pandemic, and avoidance of tracheostomy.

Keywords

fine-needle aspiration, ultrasound, laryngeal mass, squamous cell carcinoma

Received May 25, 2022; accepted June 29, 2022.

The Human Subjects Research Protections Office at the University of Vermont Medical Center (UVMMC) deemed this study ''not human subjects research''; it was therefore exempt from Institutional Review Board approval.

The gold standard approach for diagnosis of laryngeal masses is direct laryngoscopy with biopsy (DLB) under general anesthesia. In patients with more advanced tumors, tracheostomy may be necessary to secure the airway to safely perform DLB and obtain tissue. The use of in-office transcervical ultrasound (TCUS)–guided fine-needle aspiration (FNA) is well established for thyroid nodules, base of tongue lesions, and cervical lymph node metastases, and its use for diagnosis of laryngeal cancer has increased in recent years.[1-4] We present a technique for in-office transcervical FNA of N0 laryngeal masses using ultrasound guidance.

Technique

Workup

In patients with stable airways, workup includes problem-focused history and physical examination. Transnasal flexible laryngoscopy is performed in all cases of suspected laryngeal masses. Computerized tomography neck with contrast is not necessary prior to TCUS-guided FNA; however, it is often performed in patients prior to initial consultation.

Indication

TCUS-guided laryngeal FNA is considered in cases where patients have stable respiratory status, no cervical lymphadenopathy, and when the mass can be identified on ultrasound. The selection criteria included patients presenting to the University of Vermont Medical Center Division of Otolaryngology between January 2019 and December 2021 with initial extralaryngeal extension of laryngeal mass, no cervical lymphadenopathy, and the ability to visualize the mass on ultrasound.

Proposed benefits vs traditional DLB include the following: office-based minimally invasive diagnostic technique with limited risk, avoidance of tracheostomy, nonaerosolizing procedure (useful during the COVID-19 pandemic), rapid preliminary diagnosis with on-site cytopathologists, and minimal side effects.

[1]Robert Larner, MD College of Medicine at the University of Vermont, Burlington, Vermont, USA
[2]Division of Otolaryngology, University of Vermont Medical Center, Burlington, Vermont, USA
[*]Olivia Quatela is also affiliated to Department of Surgery, SUNY Upstate Medical University

Corresponding Author:
Olivia Quatela, Robert Larner, MD College of Medicine at the University of Vermont, 89 Beaumont Ave, Given Medical Building, Burlington, VT 05401, USA
Email: oquatela@u.rochester.edu

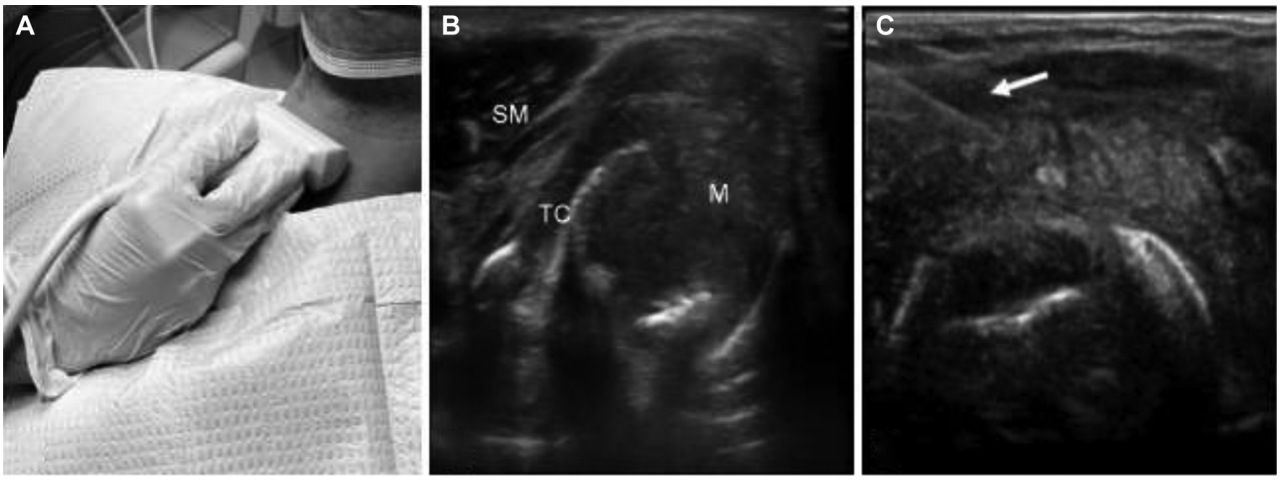

Figure 1. Laryngeal mass transcervical ultrasound technique. (a) Patient positioning and probe placement. (b) Mass identification through ultrasound. (c) Ultrasound-guided fine-needle aspiration with the arrow pointing to the needle. M, laryngeal mass; SM, strap muscles; TC, thyroid cartilage.

Procedure

The patient is first positioned in the office chair, reclined to 30°, with a pillow behind the shoulders to extend the neck. A Phillips iU22 ultrasound machine with the 12.5-MHz linear array probe is used to identify the laryngeal mass. The overlying skin is marked with a surgical pen and thoroughly cleaned with alcohol; after which, 2% lidocaine with epinephrine is injected along the expected biopsy tract. The FNA is performed with a 25-gauge needle under ultrasound guidance (**Figure 1**). Samples are analyzed by on-site cytopathologists to confirm adequate sample and provide preliminary results. Samples may be air-dried, fixed, spun into cell blocks, or sent to flow cytometry.

Results

Between 2019 and 2021, six patients presented to the University of Vermont Medical Center Division of Otolaryngology with N0 laryngeal masses that were initially diagnosed with TCUS-guided FNA (**Table 1**). Out of 6 patients, 5 were diagnosed with squamous cell carcinoma on FNA. One patient had an indeterminate result of atypical chondrocytes and went on to have non-urgent operative biopsy and debulking to confirm the diagnosis of low-grade chondrosarcoma. No patients experienced adverse outcomes related to the FNA. Four patients had tumors that obscured visualization of the airway. One of these patients ultimately underwent awake tracheostomy 26 days after initial diagnosis with FNA and core needle biopsy 37 days later for PDL-1 testing.

Discussion

Ultrasound is a well-established imaging modality for assessing laryngeal structures and masses. The application of ultrasound to image-guided biopsy of base of tongue, hypopharynx, thyroid nodules, and cervical lymph node metastases has been well documented, and its use in laryngeal cancer has been increasing in recent years.[1-4] Ultrasound-guided biopsy has high sensitivity and specificity, which are replicated through this technique to target laryngeal masses.[1] All patients in our study with squamous cell carcinoma were correctly diagnosed. The final patient had atypical chondrocytes and subsequently underwent biopsy and debulking, which revealed a diagnosis of chondrosarcoma.

While TCUS-guided FNA does not replace the role of DLB for tumor mapping and surgical preparation, it proved to be a low-risk alternative that allowed for rapid tissue diagnoses.[2,3] Many of these patients had significant airway abnormalities, which would have necessitated tracheostomy in 4 cases to safely perform DLB. Tracheostomy results in hospitalization, with relative delay in diagnosis and treatment as compared with TCUS-guided FNA, with potentially worse outcomes. Previous studies suggested that time to pathologic diagnosis with DLB was 40 to 50 days, while TCUS-guided FNA can be performed at the initial consultation with a 7-day time to pathologic diagnosis.[2,3] With TCUS-guided FNA, patients may proceed directly to definitive surgical treatment, with DLB performed at the time of the procedure. Patients who are not candidates for curative therapy benefit by avoiding an operative intervention. This technique also likely contributes significant cost savings. Although not measured in this study, prior work has demonstrated that cost of DLB per patient is $981 vs US-guided FNA, which costs $368.50.[2] In our study of 6 patients, TCUS-guided FNA yields cost savings of $612.50 per patient or total cost savings of $3675.[2]

Flexible laryngoscopy with biopsy (FLB) is another procedure that shares many of the same benefits as TCUS-guided FNA, including reduced time to diagnosis and avoidance of an additional operating room procedure.[2,3] TCUS-guided FNA has several advantages over FLB, such as avoidance of an aerosolizing procedure and reduced risk of bleeding and airway swelling. Though in-office FLB is generally considered safe, in a study by Wellenstein et al, 1 patient out of 187 had airway swelling requiring tracheostomy.[5]

The limitations of this study include the small sample size. This technique can be limited by lack of clinician proficiency

Table 1. Case Overviews for Patients Who Underwent TCUS-Guided FNA of Laryngeal Masses.

Patient	1	2	3	4	5	6
Age, sex	55 y, male	58 y, male	55 y, male	71 y, male	64 y, female	72 y, female
Presentation	6 mo of left-sided sore throat, otalgia, and progressive hoarseness	3 mo of voice change, progressive dyspnea, and stridor	Progressive dysphagia, odynophagia, and difficulty breathing	3 mo of voice change, shortness of breath, dysphagia, odynophagia, hemoptysis, and 20-lb weight loss	Laryngeal mass identified incidentally on imaging performed for sternal wound infection	6 mo of hoarseness and left-sided throat discomfort
Flexible laryngoscopy	Ulcerative lesion emanating from the left vestibular fold with poor left true vocal cord mobility and normal right true vocal cord mobility	Obstructing glottic mass with bilateral decreased true vocal fold mobility	Irregular right glottic mass extending from the vocal fold to the laryngeal surface of the epiglottis with fixed right vocal cord	Ulcerative mass involving the false and true vocal cords bilaterally and petiole. Mobile vocal folds	Fullness in the right subglottis, airway patent	Left-sided supraglottic swelling extending along the aryepiglottic fold
CT report	2.7 × 1.6 × 3.6–cm supraglottic mass with erosion through the thyroid cartilage and no cervical lymphadenopathy	2.8 × 4.0 × 4.2–cm left-sided laryngeal mass eroding through the cricoid cartilage with no cervical lymphadenopathy	Erosive laryngeal mass involving cricoid cartilage measuring 4.3 × 2.5 × 1.8 cm. No cervical lymphadenopathy	Laryngeal mass measuring up to 17 mm in largest dimension. No cervical lymphadenopathy	Laryngeal mass centered in right cricoid cartilage 2.6 × 1.4 × 1.9 cm. No cervical lymphadenopathy	Left laryngeal mass measuring 3.8 × 1.9 × 3.2 cm with concern for encasement of the left internal carotid artery. No cervical lymphadenopathy.
TCUS-guided FNA result	SCC	SCC	SCC	SCC	Atypical chondrocytes	SCC
Complication of TCUS-guided FNA	None	None	None	None	None	None
Procedure	Total laryngectomy with bilateral selective neck dissection	Total laryngectomy with left thyroid lobectomy and bilateral selective neck dissection 5 d after FNA	Total laryngectomy with right selective neck dissection 3 d after FNA	Total laryngectomy with bilateral selective neck dissection and left thyroid lobectomy 5 d after FNA	Direct microlaryngoscopy with biopsy and debulking 47 d after FNA	Nonresectable disease. Patient underwent awake tracheostomy to facilitate additional treatment 26 d after FNA
Stage	cT4aN0M0 pT4aN3bM0 (largest nodal foci, 2.2 mm)	T4aN0M0	T4aN0M0	T4aN0M0	T1aN0M0 chondrosarcoma	cT4bN0M0

Abbreviations: CT, computed tomography; FNA, fine-needle aspiration; SCC, squamous cell carcinoma; TCUS, transcervical ultrasound.

with ultrasound. Additionally, each case presented with extralaryngeal extension. Tumors without this feature may be less easily visualized and accessible. Future applications to consider include using TCUS-guided FNA in earlier-stage lesions amenable to organ-sparing treatment, which would eliminate a trip to the operating room.

Author Contributions

Olivia Quatela, completed literature search, patient chart reviews, and wrote and edited the manuscript; **Quinn Self**, completed literature search, patient chart reviews, and wrote and edited the manuscript; constructed the figures and images; **Heather Herrington**, contributed patients to the series; performed ultrasound-guided transcervical fine-needle aspirations; reviewed and edited the manuscript; **William Brundage**, contributed patients to the series; performed ultrasound-guided transcervical fine-needle aspirations; reviewed and edited the manuscript; **Damon Silverman**, contributed patients to the series; performed ultrasound-guided transcervical fine-needle aspirations; reviewed and edited the manuscript; **Mirabelle Sajisevi**, contributed patients to the series; performed ultrasound-guided transcervical fine-needle aspirations; reviewed and edited the manuscript.

Disclosures

Competing interests: None.

Sponsorships: None.

Funding source: None.

References

1. Smith A, Grady A, Vieira F, Sebelik M. Ultrasound-guided needle biopsy for diagnosis of advanced-stage malignancies of the upper aerodigestive tract. *OTO Open*. 2017;1(1):2473974X17690132.
2. Ahn D, Lee GJ, Sohn JH. Time and cost of ultrasound-guided fine-needle aspiration biopsy/core-needle biopsy for primary laryngohypopharyngeal squamous cell carcinoma. *Otolaryngol Head Neck Surg*. 2021;164(3):602-607.
3. Ahn D, Lee GJ, Sohn JH, Lee JE. Percutaneous ultrasound-guided fine-needle aspiration cytology and core-needle biopsy for laryngeal and hypopharyngeal masses. *Korean J Radiol*. 2021;22(4):596-603.
4. Reeder A, Aulet R, Sajisevi M, Brundage W. Feasibility of in-office fine-needle aspiration for base of tongue tumors. *Otolaryngol Head Neck Surg*. 2020;163(4):849-851.
5. Wellenstein DJ, de Witt JK, Schutte HW, et al. Safety of flexible endoscopic biopsy of the pharynx and larynx under topical anesthesia. *Eur Arch Otorhinolaryngol*. 2017;274(9):3471-3476.