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ORIGINAL RESEARCH

Laryngoscope Investigative Otolaryngology

Assessing the role of ultrasound for the evaluation of adult neck masses

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Abstract

Objectives: The American Academy of Otolaryngology clinical practice guidelines recommend cross-sectional imaging or fine needle aspiration for any neck mass in an adult that persists beyond 2 weeks that is not convincingly related to a bacterial infection. We aimed to assess the role of ultrasound in the evaluation and management of neck masses.

Methods: A retrospective chart review was performed of adult patients evaluated in the Otolaryngology clinic at a single institution from December 2014 to December 2015 for a visible or palpable neck mass persistent beyond 2 weeks who had an ultrasound exam as part of their initial workup. Patients with a history of head and neck malignancy or those presenting wtih primary salivary or thyroid gland lesions were excluded. Sonographic features, demographics, imaging, and biopsy results were recorded.

Results: Of the 56 patients who met inclusion criteria, 36 (64.3%) received FNA or biopsy, of which 18 (50%) demonstrated malignant pathology. Twenty patients (35.7%) demonstrated benign features on ultrasound and did not undergo tissue sampling. Two of these 20 patients underwent subsequent cross-sectional imaging. Eight of these 20 patients were followed with serial ultrasound with an average of 3 exams over 14.7 months. The remaining 12 patients had spontaneous resolution of their adenopathy. None of these 20 patients was subsequently diagnosed with malignancy.

Conclusion: In this study, approximately one third of patients presenting with a visible or palpable neck mass were able to safely avoid cross-sectional imaging and/or tissue sampling when ultrasound demonstrated features consistent with benign pathology. Our results suggest that ultrasound can play a useful role in the initial evaluation and management of adults presenting with a neck mass.

Level of Evidence: IV.

KEYWORDS

cervical adenopathy, clinical practice guidelines, neck mass, ultrasound

1 | INTRODUCTION

Neck masses are a common presenting complaint for patients in the otolaryngology clinic. In adults, most persistent neck masses are cancer.[1] Therefore, neck masses in the adult patient should be considered malignant until proven otherwise, particularly because patient outcomes are worse if diagnosis and treatment are delayed.[2,3] Several studies have reported that the average delay from the time of initial presentation of a neck mass to the diagnosis of a head and neck squamous cell carcinoma (HNSCC) is 3–6 months.[4–6]

To help avoid diagnostic and treatment delays in adults with neck masses, the American Academy of Otolaryngology (AAO) published evidence-based guidelines in 2017 for the work-up of this population.[7] These AAO clinical practice guidelines (CPG) outline in-depth, actionable steps for the evaluation of these patients with the goals of promoting the efficient and accurate diagnostic workup of potentially malignant neck masses.[7] For patients with specific risk factors or neck mass characteristics, cross-sectional imaging or fine needle aspiration (FNA) is recommended. While the risks of these procedures are outweighed by the benefit of promptly diagnosing a head and neck malignancy, there may be room early in this algorithm for additional low-risk diagnostic steps.

The objective of this study was to assess the use of ultrasound in the management of adults evaluated in the Otolaryngology clinic with a palpable neck mass present for 2 weeks or more, as this is considered in the AAO CPG to be a feature deemed at increased risk for malignancy with recommendations to order a CT or perform FNA. In contrast to CT, ultrasound avoids radiation exposure, has minimal risk and may provide diagnostic details to suggest benign pathology, which we hypothesize can obviate the need for additional invasive procedures. Additionally, concerning ultrasound exam findings may prompt more expedited referral or tissue sampling.

2 | METHODS

A retrospective review was performed of patients 18 years of age or older who presented to the Otolaryngology clinic at a single academic institution from 12/2014 to 12/2015 with a visible or palpable neck mass present for >2 weeks. This time frame was selected to allow for long length of follow up. Potential patients were initially identified through the presence of an ICD-10 diagnosis code R22.1 (localized swelling, mass and lump, neck) or R59 (enlarged lymph nodes). The chart was then reviewed to confirm that the patient was evaluated in the specified time frame with a visible or palpable neck mass on exam and had an ultrasound exam performed as part of their work-up. Patients with imaging prior to Otolaryngology evaluation were included but excluded if they had already received a definitive pathologic diagnosis. Patients with a history of prior head and neck malignancy, primary salivary gland or thyroid lesion were excluded. Patient demographics, tobacco use, and mass size were recorded. The sonographic features of the neck masses documented in the chart were collected as well as other imaging results including neck CT and MRI, if performed. In cases where tissue samples were obtained from FNA, core needle or open biopsy techniques, pathologic diagnosis was collected. For ultrasound and ultrasound guided FNA performed in our clinic, a Phillips iU22 US machine with a 12.5 MHz linear array probe was used, and was performed by one of three Otolaryngologists with at least 5 years of clinical ultrasound experience. If FNA was performed, the overlying skin was marked with a surgical pen and the skin thoroughly cleaned with alcohol. Two percent of lidocaine with epinephrine was injected along the expected biopsy tract. The FNA was performed using a 25-gauge needle under ultrasound guidance. Technique for ultrasound and FNA done outside our Otolaryngology clinic prior to consultation varied based on location and institution where performed. Patients were stratified into two groups based on pathologic or clinical diagnosis of their neck mass: malignant and benign. Paired *t* test was used to determine significance of age and mass size, while chi-squared was used to determine significance of gender and tobacco use between patients with benign and malignant pathologies. This study was approved by the study site Institutional Review Board.

3 | RESULTS

A total of 56 patients with a visible or palpable neck mass and had ultrasound as part of their work up met inclusion criteria; 30 were female, and 26 were male with an average age of 46 ± 18 years. Malignancy was diagnosed in 18 patients through FNA, core or open biopsies. The remaining 38 patients were classified as having benign etiologies either through tissue sampling ($n = 18$) or clinical impression and follow up ($n = 20$) (Figure 1).

3.1 | Malignant neck masses

Of the 18 patients diagnosed with malignancy, 10 of 18 (55.6%) were male, 12 (66.7%) had a history of tobacco use, and the average age was 60 ± 18 years. The average size of the masses was 3.05 ± 1.2 cm (Table 1). Prior to the Otolaryngology consult visit, 7 of the 18 patients had already completed an ultrasound, three had a CT neck, and two had both CT neck and ultrasound. Ultrasound was performed in the office by the consulting Otolaryngologist for 17 of the 18 patients either as the initial diagnostic imaging modality, confirmation of prior imaging findings, or for US guided tissue sampling (the remaining subject was an inpatient at the time of Otolaryngology consult hence did not receive ultrasound). Tissue sampling was performed by the consulting Otolaryngologist at the initial visit in 16 patients (14 FNA, 1 open lymph node biopsy, 1 floor of mouth biopsy); with 13 FNAs diagnostic of malignancy and one FNA non-diagnostic. An average of 4.94 ± 8.1 days elapsed between initial otolaryngology visit and a diagnosis of malignancy. Six patients underwent subsequent tissue sampling for further characterization of their malignancy (i.e., lymphoma sub-typing). All patients with a malignancy had at least one abnormal ultrasound finding (Table 2).

FIGURE 1 Diagnoses of neck mass in study population

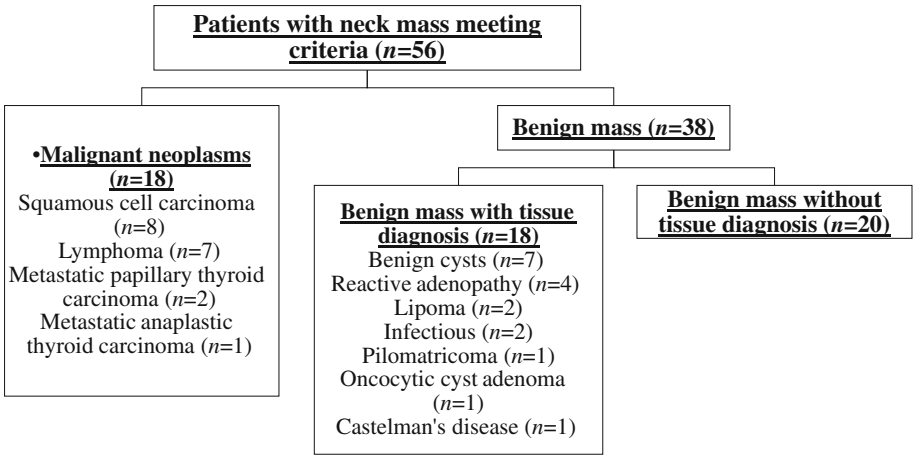

TABLE 1 Comparison of patients with benign and malignant neck masses

		Benign disease $n = 38$	Malignant disease $n = 18$	Total $n = 56$	p
Age	Age, years	40 ± 13	60 ± 18	46 ± 18	<.001
Sex	Male	42.1%	55.6%	53.6%	.35
	Female	57.9%	44.4%	46.4%	
Tobacco use	Tobacco use rate (%)	55.2%	66.7%	58.9%	.42
Average size of mass	Centimeters	2.5 ± 1.5	3.05 ± 1.2	2.65 ± 1.5	.18

TABLE 2 Comparison of ultrasound findings in patients with benign and malignant neck masses

	Benign disease $n = 38$	Malignant disease $n = 18$
Hypoechoic	16 (42.1%)	8 (44.4%)
Oval	14 (36.8%)	1 (5.6%)
Round	2 (5.3%)	3 (16.7%)
Echogenic Hilum	17 (44.7%)	1 (5.6%)
No Echogenic Hilum	2 (5.3%)	4 (22.2%)
"Reactive or benign appearing"/"Morphologically normal"	9 (23.7%)	0 (0%)
Abnormal ultrasound findings[a]	11 (28.9%)	11 (61.1%)

[a]Abnormal Ultrasound Findings are defined as ultrasound examinations that included any of the following descriptors: round shape, no echogenic hilus, necrotic, containing calcifications, cystic, abnormal vascularity, thickened cortex, "matted nodes," "pathologic appearing," "pathologically enlarged," "concerning for malignancy/metastasis," "suspicious" "abnormal morphology," and "loss of normal architecture."

3.2 | Benign neck masses

Thirty-eight patients were diagnosed with benign disease; 16 (42%) were male, 21 (55.2%) had a history of tobacco use. The average age for these patients was 40 ± 13 years and average size of the masses was 2.5 ± 1.5 cm (Table 1). Ultrasonographic features found in this group were varied given the multiple diagnoses, with 11 (28.9%) patients having abnormal ultrasound findings (Table 2).

Eighteen patients in the benign group underwent tissue sampling; three of these patients had FNA, six had open biopsy/excision, and nine had both FNA and open biopsy/excision. All tissue sampling with the exception of two FNAs was performed by the consulting Otolaryngologist. Prior to the Otolaryngology visit, 7 of the 18 patients had already completed ultrasound, 3 had CT, and 1 had both MRI and ultrasound. In office ultrasound was performed by the consulting Otolaryngologist for 17 of the 18 patients either as the initial diagnostic imaging modality, confirmation of prior imaging findings, or for US guided tissue sampling.

The remaining 20 patients in the benign group did not undergo tissue sampling and were clinically diagnosed with benign cervical lymph node(s) or benign soft tissue masses such as lipoma based on ultrasound performed in the Otolaryngology clinic. These patients were followed for an average of 4 ± 2 years–defined as the time between date of initial presentation to Otolaryngology and date of last follow up with any provider. Prior to Otolaryngology consultation, 6 of the 20 patients had already completed ultrasound, one had CT, and one had both CT and US. Two patients had MRI or CT after initial ultrasound exam. None of the 20 patients with clinically suspected benign neck mass was subsequently found to have a malignancy.

4 | DISCUSSION

The primary purpose of the AAO CPG for the evaluation of adult neck masses is to provide an algorithm to promote timely evaluation and

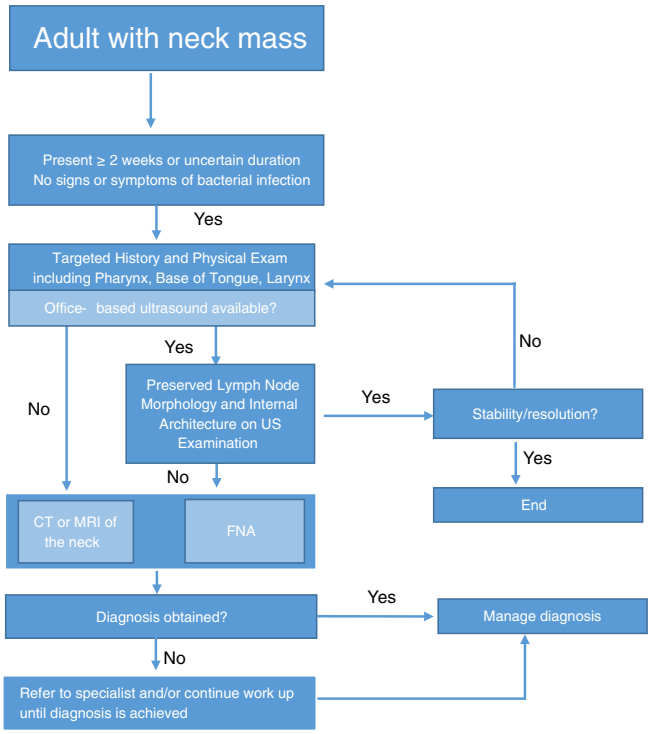

FIGURE 2 Algorithm for the management of an adult neck mass incorporating the use of diagnostic ultrasound examination

reduce diagnostic delays in patients with neck masses who are at risk for malignancy. Ultrasound is not formally recommended in these guidelines but is discussed as an alternative diagnostic study and as an aid to performing FNA or Core Needle Biopsy. However, the literature supports that ultrasound has excellent diagnostic accuracy in assessing malignant cervical lymph nodes.[3,8] In our study, all patients ultimately diagnosed with malignancy had at least one abnormal ultrasound finding (Table 2).

Ultrasound can additionally be used to guide FNA to facilitate tissue diagnosis with high diagnostic accuracy as shown in this study and others.[9] Furthermore, ultrasound evaluation did not delay diagnosis, and likely expedited tissue sampling—when indicated—for patients in our study. Half of the patients diagnosed with malignancy had an ultrasound completed prior to otolaryngology consultation, showing that at least a portion of primary care providers are already utilizing this modality in their evaluation. Further work is needed to determine whether ultrasound shortens time from referral to specialty consultation.

The current AAO CPG would have recommended that all 56 patients in this study receive cross-sectional imaging or FNA given that they presented with a persistent neck mass beyond 2 weeks.[7] We found, however, that use of ultrasound helped determine which patients should proceed to cross-sectional imaging or FNA, and which could be observed or monitored with serial diagnostic US exam as outlined in our management algorithm which is drawn from the AAO CPG[7] (Figure 2). Patients in the malignant disease group all had concerning features on US exam and thus received prompt tissue sampling.

In contrast, the remaining 20 patients in the benign group (35.7% of our study population) did not receive tissue sampling based on a low index of suspicion for malignant disease and reassuring ultrasound findings. Only two of these patients underwent subsequent cross-sectional imaging after serial ultrasound exam demonstrated persistence of their neck masses. None of these 20 patients was subsequently found to have a malignant process. This represents a significant proportion of patients managed apart from the CPG without any adverse outcomes. Furthermore, avoidance of cross-sectional imaging and tissue sampling limits patient risk and may represent a cost savings.

One drawback to ultrasound is its dependence on the operator's experience with subjective interpretation of ultrasonographic findings. Additionally, there is not a standardized method of reporting ultrasound findings which can result in ultrasound exams providing an impression that a mass is pathologic without delineating specific features, as we discovered in our chart review. Furthermore, other patient factors such as age, gender, size of mass, and history of tobacco use may influence the overall impression on ultrasound exam. In our study, however, there was no significant difference in these features between the benign and malignant groups other than the age of the patient.

While our study is promising, it is limited by a small sample size and retrospective nature. The results may not be generalizable to centers where Otolaryngologists are not experienced in the use of cervical ultrasonography and ultrasound-guided FNA, or for studies performed by radiologists with varying degrees of expertise.

5 | CONCLUSION

The findings of this retrospective review suggest that ultrasound can play a useful role in the management of adult patients with neck masses. This strategy could potentially result in safely focusing the use of cross-sectional imaging or FNA to higher risk patients and expediting diagnosis as demonstrated in our study.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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